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Rear Admiral E.C. Kalbfus, U.S.N.

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Chambers, I.R.

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Slides

THE NORTH ATLANTIC OCEAN

NEWFOUNDLAND AND THE MARITIME PROVINCES

TO

THE BRITISH ISLES

INCLUDING

GREENLAND AND ICELAND

STAFF PRESENTATION

DECLASSIFIED IAW DOD MEMO OF 3 MAY 1972, SUBJ:
DECLASSIFICATION OF WWII RECORDS

NAVAL WAR COLLEGE
Newport, R.I.
April 21, 1941

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THE NORTH ATLANTIC OCEAN

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INCLUDING

GREENLAND AND ICELAND

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at the

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Resumé of Presentation

Strategic Area of the North Atlantic Ocean; Newfoundland and the Maritime Provinces to The British Isles, including Greenland and Iceland.

Given by Commander I.R. Chambers, U.S.Navy.

April 21, 1941.

The Strategic Area of the North Atlantic is of vital interest: (1) to Great Britain for the receipt of American and Canadian aid in the present war; (2) to the United States for (a) the positive delivery of such aid to Britain as authorized by the Lease-Lend Bill, and (b) the defense of the Western Hemisphere, and (3) to the Axis Powers for cutting off outside aid to the British Isles.

The weather in this area is generally bad. Winds are from the N.W. to S.W. above force 4 from 65% to 80% of the year with lesser winds at a maximum of 35% in the summer months. Fog, rain, haze and mist persist from 15% to 35% of the year, mostly during the summer. The heavy fogs occur mostly off Newfoundland, while the haze and mist are off the British Isles. Clouds cover the area from 60% to 70% of the year with mostly low clouds 60% to 75% of these clouds.

There are three kinds of ice found off the Grand Banks southeast of Newfoundland and in the Western North Atlantic; (1) harbor ice, (2) field ice, and (3) icebergs. The first is not as serious as the other two, but from December to May it

generally prevents the use of ports in Greenland, Labrador, Newfoundland and many in Nova Scotia. The field ice appears about January and lasts until April, but the icebergs, which are detached pieces of field ice, are not generally clear from the Grand Banks until late May or early June. The United States Coast Guard patrols the iceberg area, during which time trans-Atlantic shipping is routed by various southern lanes to clear these icebergs.

The mean daily temperatures in the Western North Atlantic vary from 10° to 26° F. in January, while in the Eastern North Atlantic they vary from 26° to 43° F. due to the warming effect of the Atlantic Current.

The North Atlantic is the busiest cable area in the world, due to the great number of cables laid between the Avalon Peninsula in Newfoundland and the Eastern Hemisphere. The United States owns or leases all the cables in the North Atlantic between Europe and North America except three: from Halifax:- to Harbor Grace to Land's End; to the Azores; and to Bermuda; from Cape Cod to Brest; and one from New York to the Azores. The area is well covered by radio stations, including several in Greenland and Iceland.

The central part of the North Atlantic is too deep for mining, but the surrounding land areas have mineable waters off each coast, including a wide area between Greenland and Iceland and thence southeast to the British Isles. The whole area of the North Sea can be mined as well as

the coast of Norway. Mining around Newfoundland, Labrador and Greenland is a seasonable effort -- when there is no ice present, generally in the summer and fall months.

The North Atlantic Trade routes, even in peace time, are the busiest and richest in the world. 30% of the United States trade passes over these shipping lanes. The main focal points for this trade are: (1) off Newfoundland, (2) the Northwestern approach to the British Isles, and (3) Southwestern British Isles in the area off St. George Channel and the English Channel.

In the area of the Western North Atlantic there are many subsidiary base sites for small units that are well located relative to the trade lanes. The best are Lunaire Bay, Bay of Exploits, St. John's Harbor, Little Placentia Harbor, St. Pierre, Port au Port - St. George Bay area, Sydney Harbor, Halifax with Bedford Basin, and St. John, New Brunswick. Halifax is the only Fleet base. Of these locations, the United States is establishing bases at St. John's, Little Placentia Harbor and St. George Bay, Newfoundland.

Greenland, an outpost for hemisphere defense, is covered with an ice-cap and has not been developed for military or naval use. Although on the flank of North Atlantic shipping lanes, its distance therefrom is great, and harbors are not adequate for many naval vessels. Air operations during the summer, when the harbors are open, may be undertaken. The principal places from which small air units may operate are Julianehaab, Arsuk Fiord, Godthaab, Holsteinsborg Harbor, and Angmagssalik.

Iceland is suitable for seaplane and land plane operations, as the climate is warmer, but the rain fall is heavier. Reykjavik Harbor on the west coast and Reydar Fiord on the east coast are the best areas for ship and air bases. The Canadians have established a military and air base at Reykjavik and an air base at Kaldadarnes.

The Faeroe Islands have a few suitable base sites, but the best, Trangjisvaag and Vaag Fiords, are on the Island of Sydero. There are no facilities here, but the area is suitable for a few light forces and sea plane anchorages.

The Shetland Islands, 180 miles southeast of the Faeroes, are no better, but the Harbors of the Deeps and Lerwich Harbor can accommodate small units of light forces and seaplanes.

In the British Isles there are many bases and base sites, only the most important covering the "Northwest Approach" are here given. The one main fleet base in the northern theater is at Scapa Flow in the Orkneys. The other bases and base sites are the Dockyard Port of Cromarty, including Invergordon and Inverness on the east coast of Scotland; Glasgow, Liverpool and Pembroke on the west coast of Scotland and England; and Rathmullan on Lough Swilly, Blacksod Bay, Clew Bay, Galway Bay, Bear Haven on Bantry Bay, and Haulbowline on Cork Harbor, on the west and south coasts of Eire. Bear Haven and Haulbowline were busy bases during World War I.

The North Atlantic Ocean and its shipping lanes can be completely covered two or more times by air operations from New-

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foundland, Greenland, Iceland and the British Isles, utilizing the many existing and possible air bases on the west, north and east of this ocean area. At present the Western North Atlantic, west of 30° West longitude is free from Axis aircraft, except sporadic reconnaissance, but east of 30° West longitude, Axis aircraft can cover two or more times by air operations from bases under their control, the eastern North Atlantic, particularly the Northwestern Approach to the British Isles.

Great Britain and its Dominions in the North Atlantic theater have great strength of relative position, with adequate bases both East and West. The British means available are lacking at present to achieve the necessary freedom of action and protection of shipping in the Northeastern Atlantic.

H. H. Crosby
H. H. Crosby,
Captain, U.S.N.
Chief of Staff.

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Subject

Shetland Islands

The Hebrides and Orkney Islands

BT/Ship Lines

Scapa Flow

Inverness

Invergorston

Glasgow and

Liverpool

Lampara Bay

Elle

Lough Swilly

Blackhead Bay

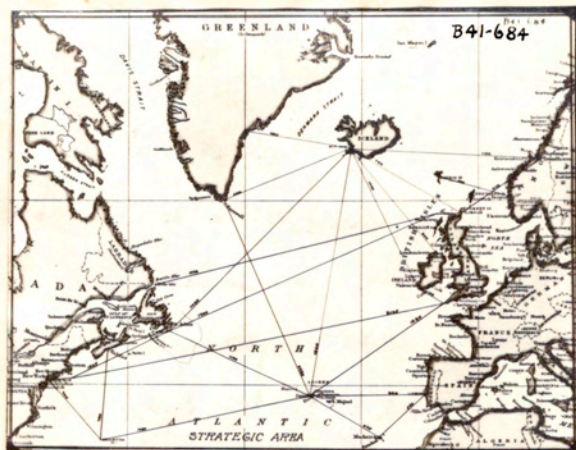
Olew Bay

Galway Bay

Santry Bay - Ballyvaughan

Malinbeg - Glenties

off Government of North Atlantic



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Today's presentation takes us to the strategic area of the North Atlantic.

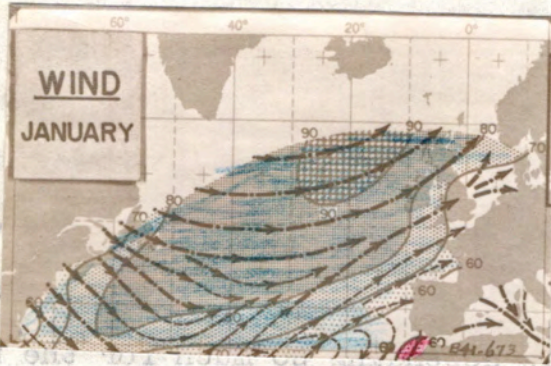
SHOW #1 (B41-684)

This area is important at the present time, for it contains one of the busiest of trade routes, that route between Canada, the United States and the British Isles, over which Great Britain is depending so much for the necessities with which to carry on the present war.

The particular area under consideration lies between eastern Canada (Newfoundland and the Maritime Provinces) and Labrador on the west; Greenland, Iceland and a vast expanse of ice on the north; the British Isles, the Shetland and Faeroe Islands, and Norway on the east; and the central Atlantic Ocean to the south. To say the least, this water area is enough to try the patience of any mariner and is one of the worst areas in the world for navigation. All year, the weather conditions are bad, except for intermittent periods of fair weather. If there are no strong winds or ice, then there is fog, mist or haze, and it is cold, particularly in the Western Atlantic.

The weather in this North Atlantic area can be determined by describing four factors: wind, fog, ice and temperature.

Today's presentation takes us to the strategic area of the North Atlantic.



SHOW 1

No. 2.

The particular area under consideration lies between



No. 3.

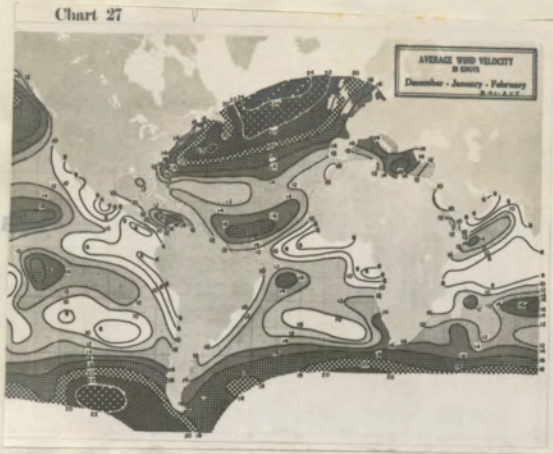
of the worst areas in the world for navigation. All year, the weather conditions are bad, except for intermittent periods of fair weather. If there are no strong winds or ice, then there is fog, mist or haze, and it is cold, particularly in the western Atlantic.

The weather in this North Atlantic area can be determined by describing four factors: wind, fog, ice and temperature.

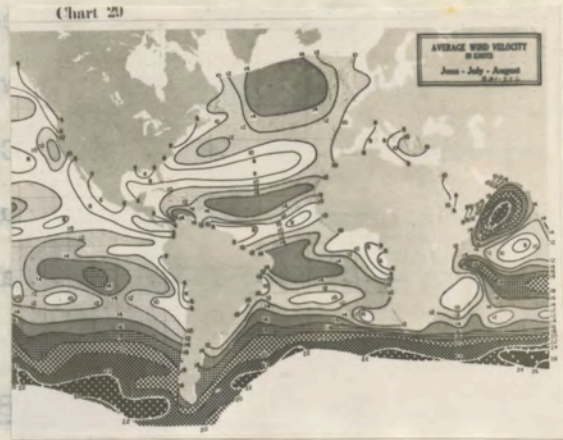
The winds are controlled generally by the "Iceland Low" which deepens in the winter but still exists in the summer, by the "high" over Canada in the winter and "low" in the summer, and by the succession of storms which cross the United States and Canada and pass far out to sea.

CUT #1. SHOW #2 (B41-673) and #3 (B41-674)

2.01 4.01
These two slides show the predominant direction, constancy and force of the surface winds for January and July. The blue areas indicate winds of force 4 and over, and the red areas for force 0 to 3. The figures at the ends of the lines show the percentage of days during the month that these forces exist in the areas enclosed. The dot and dash heavy arrows indicate that 41% to 60% of the month the winds blow in the direction shown. 2.01 The light dashed arrows indicate only 25% to 40% of the month when winds blow in the direction indicated. During the rest of the months the winds may be from other directions but at the force indicated by the colored area. Note ^{that} the direction of the wind varies principally from N.W. to S.W. in the Western Atlantic and West in the Eastern Atlantic; decreasing in the summer, in the total number of days when force 4 winds may be encountered. 2.01



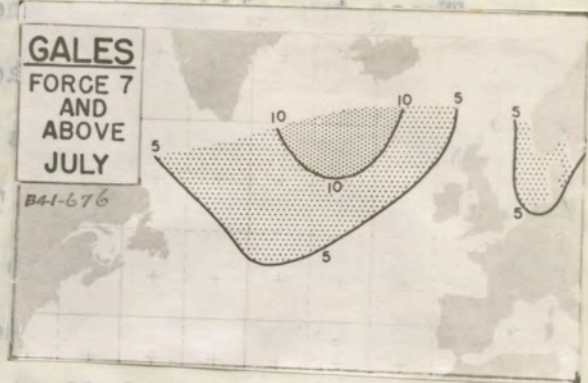
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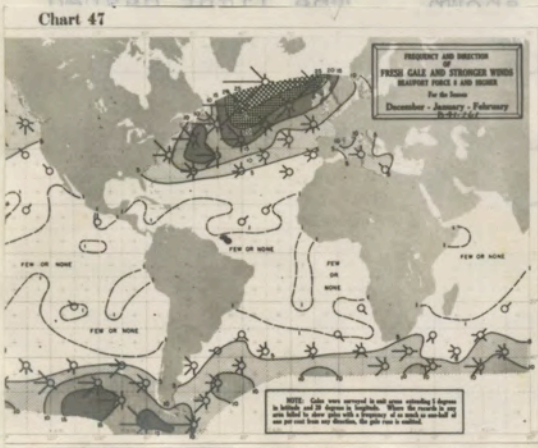
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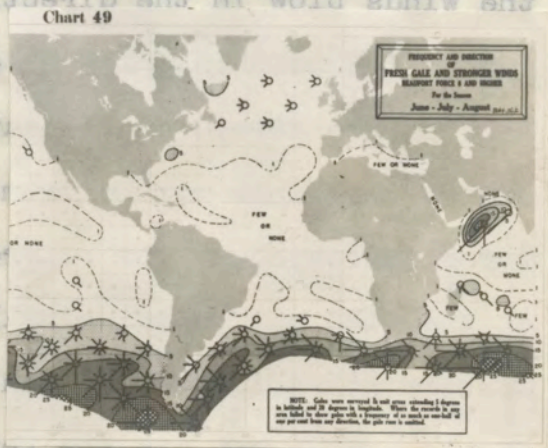
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No. 8.



No. 9.

CUT #2 and #3. SHOW #4 (B41-255) and #5 (B41-256)

Here are shown the average wind velocity in knots for, on the left, the winter months, and on the right the summer months. The darker the area, the greater the force of the wind. The greatest average shown is 22-24 knots along the main trade routes, British Isles to North America.

CUT #4 and #5. SHOW #6 (B41-675) and #7 (B41-676)

Gales of force 7 are shown for January and July. The figures indicate that there are gales of this force present in the shaded areas as high as 40% of the days of the month in the winter, decreasing to only 5-10% in the summer.

CUT #6 and #7. SHOW #8 (B41-261) and #9 (B41-262)

Here we see winds of force 8 and over. The shaded area gives the percentage of all wind observations for the months that indicate strengths of force 8 or over. The roses give the direction of the wind, with the arrow length indicating the comparative percentage of the wind direction. During the Fall months, many of the extra-tropical disturbances or hurricanes which move up the Atlantic Coast of

the United States recurve and pass northeastward close aboard Newfoundland. Note again how the number of gales has decreased during the summer.

There are practically no calms anywhere in this northern area during the year.

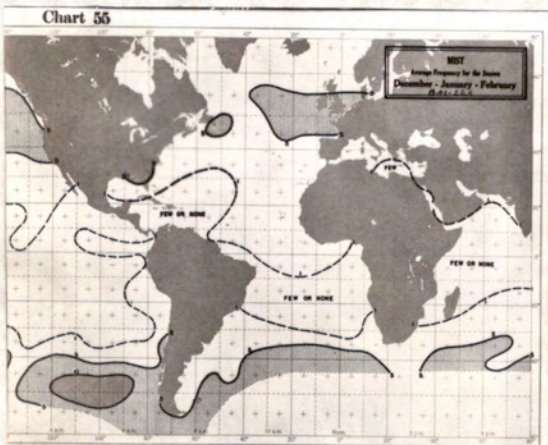
CUT #8 and #9

Whereas the strong winds and rough seas were causing us trouble in winter, conditions now change to light winds, but plenty of fog, haze and mist during the spring, summer and fall, with these conditions worst during the summer.

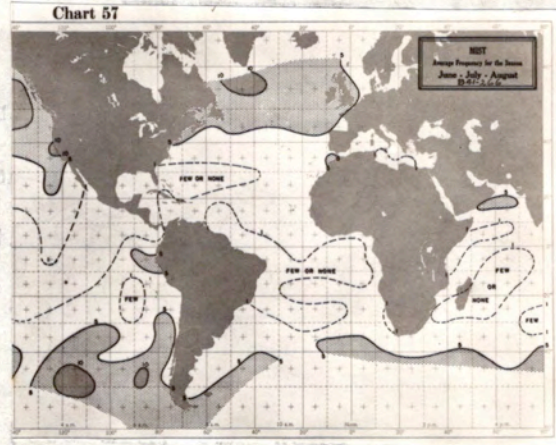
SHOW #10 (B41-263) and #11 (B41-264)

As will be noted, the strong winds in winter keep the fog away, except for 5% of the time off the Grand Banks, south of Newfoundland. This is caused by the small percentage of Southwest winds, laden with moisture, striking the colder water of the Labrador current. In the summer, however, the greatest percentage of winds is from the Southwest which for the same reason causes such a ^{great} percentage of fog. Over the British Isles, colder winds from the northern semi-circle coming south strike the warmer waters of the

the United States receive and pass northeastward close aboard Newfoundland. Note again how the number of gales has decreased during the summer. There are practically no calms anywhere in this northern area during the year.

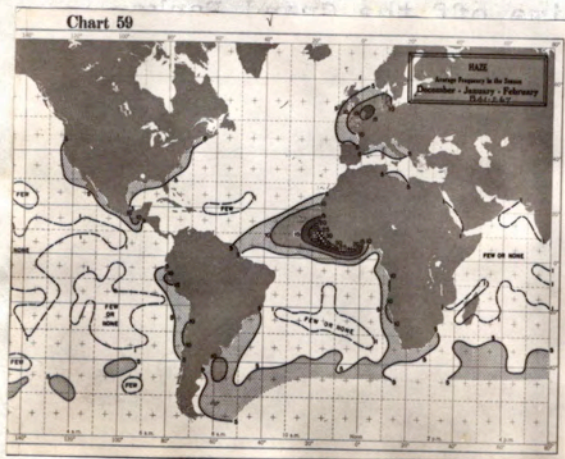


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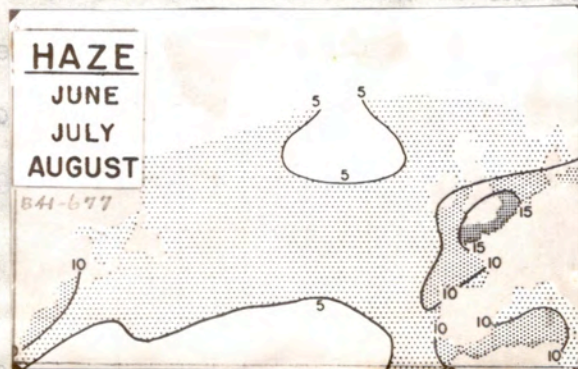


No. 13.

As will be noted, the strong winds in winter keep the fog away, except for 5% of the time off the coast of Newfoundland. This is south of Newfoundland.



No. 14.



No. 15.

Atlantic current and cause fog to a lesser extent. These northern winds and colder air in striking the Atlantic current as it proceeds Northeast do, however, cause haze and mist over practically the whole North Atlantic, north of the 40th parallel. Haze and mist are merely other terms for expressing light fog.

CUT #10 and #11. SHOW #12 (B41-265) and #13 (B41-266)

These two slides show the area covered by mist in winter and summer, with the greatest percentage of the time being in summer, 10% south of Greenland. Spring and Fall periods show an average of 5% over the whole area, including the great circle routes from Canada to the British Isles.

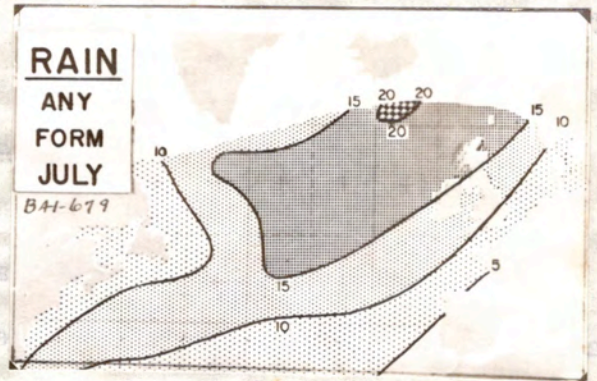
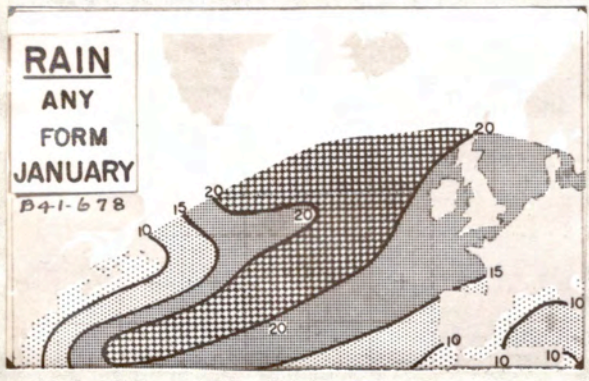
CUT #12 and #13. SHOW #14 (B41-267) and #15 (B41-677)

We now see the percentage of days in winter and summer when haze has been recorded in the area of the North Atlantic. Note the coverage by haze of the North Atlantic during the summer, particularly in the English Channel.

CUT #14 and #15

Having discussed the winds and visibility conditions, which naturally affect the air as well as surface operations,

Atlantic current and cause fog to a lesser extent. These northern winds and colder air in striking the Atlantic current as it proceeds Northeast do, however, cause haze and mist over practically the whole North Atlantic, north of the 40th parallel. Haze and mist are merely other terms



No. 16.

No. 17.

in summer, 10% of the days are foggy, including the show an average of 5% over the whole area, including the great circle routes from Canada to the British Isles.

CUT WIA and WIS. SHOW WIA (B41-677) and WIS (B41-677)

Summary of Average Annual Weather Conditions over the Far North Atlantic.

Percentages indicate percent of days in each 3 months period.

	Winter	Spring	Summer	Fall
Winds, (Force 4 and above) including gales.- } Moderate to rough seas. }	80%	70%	65%	75%
Winds (Force 0-3)- } Smooth sea. }	20%	30%	35%	25%
Fog, haze, mist.	15%	25%	35%	15%
Rain (any form).	20%	15%	15%	25%
Normal visibility.	65%	60%	50%	60%
Cloud coverage.	70%	60%	70%	70%
Low clouds.	75%	65%	60%	65%
Middle and high clouds.	25%	35%	40%	35%

B41-758

No. 18.

Having discussed the winds and visibility conditions, which naturally effect the air as well as surface operations,

We now see that when haze has been Note the coverage summer, particular CUT WIA and WIS

we now consider cloud conditions in this area which primarily affect aircraft operations.

The whole North Atlantic is covered by clouds 70% of the year. Of these clouds 20% are of the high type; 10% are of the middle type; and 60-70% are of the low cloud types, including rain clouds.

SHOW #16 (B41-678) and #17 (B41-679)

These slides show the percentage of rain in our area, in whatever form. Note as much as 20% of the time in winter and summer in certain parts of the ocean, which for these parts of the world is a yearly average. 25% is reached in the fall, south of Iceland. Steady rains over the whole North Atlantic average 10% in winter, and 5% in summer, with a maximum of 15% in the spring, while passing showers average from 5-10% all year round.

CUT #16 and #17

As a summary of average annual weather conditions over the North Atlantic theater, we may divide it into winds, visibility and clouds as follows:

SHOW #18 (B41-758)

The percentages indicate percent of days in each 3 months period.

	<u>Winter</u>	<u>Spring</u>	<u>Summer</u>	<u>Fall</u>
Winds (Force 4 and above, including gales.-) Moderate to rough seas.)	80%	70%	65%	75%
Winds (Force 0-3) - Smooth sea.	20%	30%	35%	25%
Fog, haze, mist.	15%	25%	35%	15%
Rain (any form).	20%	15%	15%	25%
Normal visibility.	65%	60%	50%	60%
Cloud coverage.	70%	60%	70%	70%
Low clouds.	75%	65%	60%	65%
Middle and high clouds.	25%	35%	40%	35%

Except for fogs which are considerably more numerous in the Western ^{North} Atlantic, and ice which is not present in the Eastern North Atlantic, conditions as shown on the slide are about the same during the year near Newfoundland, the Maritime Provinces and the British Isles, and are from 10 to 20% better than in the Central North Atlantic between the longitudes of Greenland and Iceland.

CUT #18

One of the greatest dangers which any vessel operating in the North Atlantic must meet occurs in the western part of that ocean, that is, ice. There are three kinds: the first, harbor ice, is not so serious as the other two - field ice and icebergs. Generally speaking, the harbors of Greenland, Labrador,

Winter Spring Summer Fall

80%	70%	65%	75%
20%	30%	35%	25%

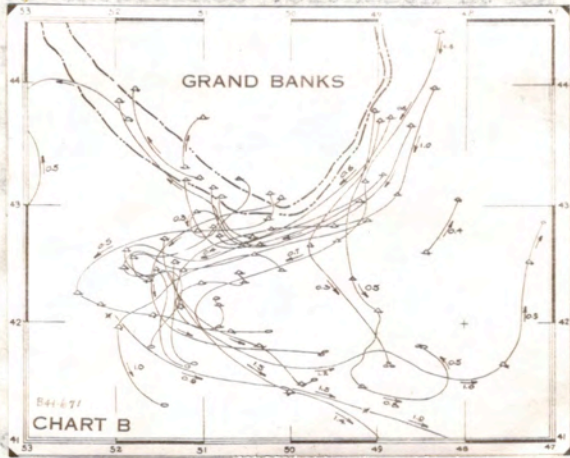


No. 19.

15% Fog, haze, mist.
20% Rain (any form).
65% Normal visibility.
70% Cloud coverage.
Low clouds.
25% Middle and high clouds.

Except for fogs which are considerably more numerous in the Western Atlantic, and ice which is not present in the Eastern North Atlantic, conditions as shown on the slide are about the same as in the North Atlantic. The Maritime Provinces are from 10 to 20% better than in the Maritime Provinces.

No. 20.



in the North Atlantic must meet occurs in the western part of that ocean, that is, ice. There are three kinds: the first, harbor ice, is not so serious as the other two - field ice and icebergs. Generally speaking, the harbors of Greenland, Labrador,

Newfoundland, and many of those in Nova Scotia freeze over during the winter. The sheltered harbors freeze over before the adjacent exposed ones. In Labrador, the ice prevents the movement of shipping from November to June; in southern Greenland, from December to May; in Newfoundland, from December to April; and in Nova Scotia, from January to March. The southern coast of Iceland, including Reykjavik, and the eastern coast, is open all year, because of the warmer Atlantic current, while the northern coast is closed only during the winter months that the Arctic pack ice frequently reaches Iceland by overcoming the warmth of the Atlantic Current which normally surrounds the island.

Some harbors are affected very little by ice. Halifax and St. John, New Brunswick, are two examples. St. John's, Newfoundland, is not frozen over often, although the field ice in the spring may block the harbor entrance occasionally.

SHOW #19 (B41-670) and #20 (B41-671)

The field ice begins to appear off Newfoundland and on the Grand Banks as early as February. The ice may be 6 to 10 feet thick. It is found as far east as 42° West Longitude, and as far south as 41° ^{North} Latitude, approximately the latitude of Boston. This field ice begins to break up generally about the latitude of Nova Scotia, 44° North, and rarely is seen south of latitude 41° North. Note that the TITANIC was sunk just north of 41° .

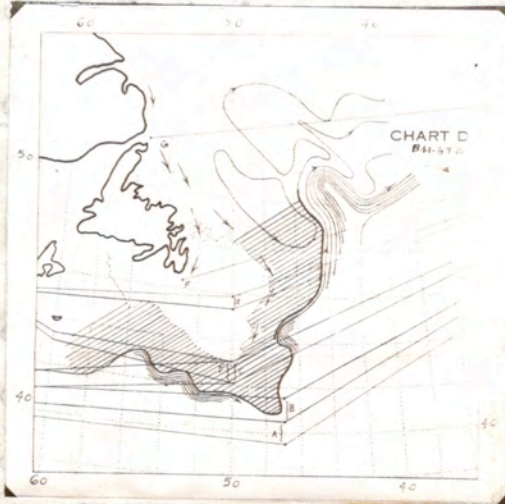
Newfoundland, and many of those in Nova Scotia freeze over during the winter. The sheltered harbors freeze over before the adjacent exposed ones. In Labrador, the ice prevents the movement of shipping from November to June; in southern Greenland, from December to May; in Newfoundland, from December to April; and in Nova Scotia, from January to March. The southern coast



AN ICE PATROL SHIP BOUNDING AN ICEBERG OFF NEWFOUNDLAND

No. 21.

Some harbors are affected very little by ice. Halifax and St. John, New Brunswick, are two examples. St. John's, Newfoundland, is not frozen over often, although the field



No. 22.

The ice may be 8 to 10 feet thick and as far as the Grand Banks of Boston, approximately the latitude 41° North, and rarely is seen south of latitude 41° North. Note that the TITANIC was sunk just north of 41°.

As the field ice breaks up, it is moved south by the East Greenland and Labrador currents. Those icebergs off Greenland are driven to the west by the current. All bergs move south along eastern Newfoundland and start to separate on the Grand Banks, some turning west and others reaching the edge of the Gulf Stream whence they move northeast. The movement of the icebergs generally depends upon the type of winter in the Arctic. An open winter (relatively mild) may cause the icebergs to start south from one to three months earlier than usual. Some pass through Belle Isle Straits, and may be encountered as late as August, but most of them head for the Grand Banks. March to June, inclusive, are the most dangerous months for icebergs.

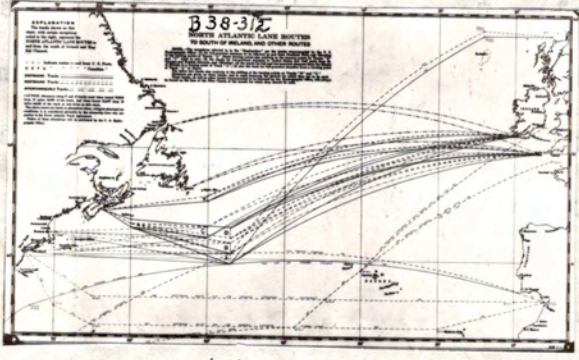
CUT #19 and #20. SHOW #21 (B38-389)

Cold water does not indicate icebergs in these latitudes because the Labrador current is cold anyway. Even the air is no reliable indication of their presence in this area. The only indication of the presence of an iceberg is to see it, and under conditions of fog in this area, seeing them is difficult.

CUT #21. SHOW #22 (B41-672)

This slide shows the general distribution of hot and cold water southeast of Newfoundland during the ice season. The off-shore boundary of the shaded areas is known as the

As the field ice breaks up, it is moved south by the East Greenland and Labrador currents. Those icebergs off Greenland are driven to the west by the current. All bergs move south along eastern Newfoundland and start to separate on the Grand Banks, some turning west and others reaching the edge of the Gulf Stream whence they move northeast. The movement of the icebergs generally depends upon the type of winter in the Arctic. In open winter (relatively mild) may cause the icebergs to start south from one to three months earlier than in a closed winter.



No. 23.

Gold water does not indicate ice in these latitudes because the Labrador current is cold anyway. Even the air is no reliable indication of their presence in this area. The only indication of the presence of an iceberg is to see it, and under conditions of fog in this area, seeing them is difficult.

CUT #31. SHOW #32 (B1-GWS)

This slide shows the general distribution of hot and cold water southeast of Newfoundland during the ice season. The off-shore boundary of the shaded areas is known as the

Cold Wall." Inshore, in the shaded area and over the Grand Banks, is the area of persistent fog which prevails during the period May to July as much as 90% of the time. The Gulf stream traveling Northeast hits the Cold Wall, proceeds around it, and after having been bumped again by the Labrador current, again proceeds Northeast, gradually warming the northern waters and melting the icebergs until east of Longitude 40° West, where there are no icebergs and the air temperature has again risen to moderate temperatures. This condition continues as the Atlantic current passes north of the British Isles, and west and north of the Scandinavian peninsula.

CUT #22. SHOW #23 (B38-312)

Due to data collected by the ice patrol. the routes shown on the slide are prescribed for vessels, in order to pass safely through the field ice and icebergs. Once through the western ice at Longitude 45° West, routes may be taken to the "northwestern approach" to the British Isles, as well as those indicated to southern Eire and Lizards Head. United States and Canadian routes east, pass through points A. B and C. The other routes are from Canadian ports. Route A is an extra southern route to be used only when necessary due to extraordinary iceberg conditions; Route B is the southern route to be used from April 11th to June 30th inclusive, except when Route A is necessary; Route C or northern route is used from July 1st to April 10th inclusive; Route D from February 15th

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WESTERN ATLANTIC
B-11-685

MEAN TEMPERATURES (F)

PLACE	January			July		
	Daily	Max.	Min.	Daily	Max.	Min.
BELLE ISLE	10°	15°	4°	48°	55°	41°
ST. JOHNS, N.F.	23°	31°	16°	59°	68°	50°
SYDNEY	22°	30°	13°	63°	72°	54°
HALIFAX	26°	32°	19°	65°	74°	55°
ST. JOHNS, N.B.	19°	28°	10°	60°	69°	52°

No. 24

EASTERN ATLANTIC
B-11-686

MEAN TEMPERATURES (F)

PLACE	January			July		
	Daily	Max.	Min.	Daily	Max.	Min.
BERGEN (NORWAY)	35°	39°	31°	57°	64°	52°
TRONDHEIM (NORWAY)	26°	44°	15°	57°	66°	44°
SCAPA FLOW (ORNEYYS)	39°	42°	36°	54°	58°	49°
INVERNESS (SCOTLAND)	39°	43°	34°	57°	64°	50°
ROSYTH (SCOTLAND)	37°	41°	33°	58°	66°	51°
LUGHSWILLY (IRE)	41°	44°	37°	57°	61°	52°
BREHAYNE (IRE)	43°	47°	39°	59°	65°	54°
LIVERPOOL (ENGLAND)	40°	46°	35°	58°	66°	51°
PLYMOUTH (ENGLAND)	42°	47°	38°	61°	67°	55°

No. 25

States and Canadian routes east, pass through points A, B and C. The other routes are from Canadian ports. Route A is an extraordinary iceberg conditions; Route B is the southern route to be used from April 15th to June 30th inclusive, except when Route A is necessary; Route C or northern route is used from July 1st to April 10th inclusive; Route D from February 15th

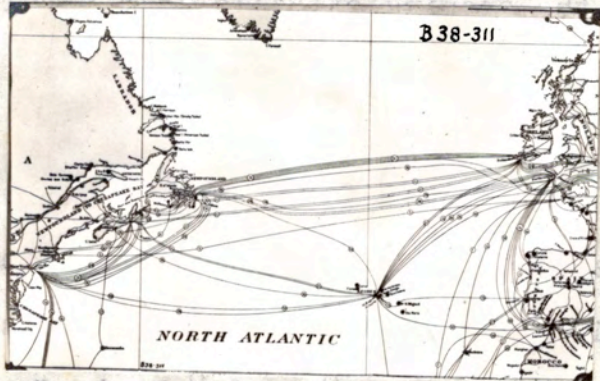
to April 10th inclusive; Route E from April 11th to May 15th until Cape Race is clear, and also from December 1st to February 14th inclusive; Route F from May 16th to the opening of Belle Isle Straits, and to November 30th when not using these straits; and Route G from the opening of Belle Isle Straits to November 14th.

CUT #23. SHOW #24 (B41-685) and #25 (B41-686)

We now come to the temperatures in the western and eastern parts of the North Atlantic. The mean daily temperatures in the Western North Atlantic vary from 10° to 26° F. in January, while in the Eastern North Atlantic they vary from 26° to 43° F. This is due to the effect of the colder Labrador and Greenland Currents in the West, and the warmer Atlantic Current which is primarily the Gulf Stream in the East. On the other hand, the mean daily temperatures for July vary from 59° to 65° F. (except Belle Isle) in the West, compared with a cooler temperature of from 54° to 61° F. in the East. This is due to the southwest winds and warmer Gulf stream in the summer having greater effect in the West than the Atlantic Current has in the East after being cooled off on its course across the Atlantic by the west winds and the cold Arctic waters.

CUT #24 and #25

to April 10th inclusive; Route B from April 11th to May 15th
until Cape Race is clear, and also from December 1st to Febru-
ary 15th inclusive; Route C from May 16th to the opening of
Belle Isle Straits, and to November 30th when not using these



CUT USA and US

No. 26.

We now come to the parts of the North Atlantic the Western North Atlantic vary from 10° to 30° F. in Janu-
ary, while in the Eastern North Atlantic they vary from 20°
to 45° F. This is due to the effect of the colder Labrador
the warmer Atlantic



No. 27.

Current with the other from 500 with a cool This is due to the southwest winds and warmer Gulf stream
in the summer having greater effect in the West than the
Atlantic Current has in the East after being cooled off on
its course across the Atlantic by the west winds and the
cold Arctic waters.

CUT USA and US

In the winter, vessels will be unable to use many harbors in the Western North Atlantic because they are frozen over. In the spring, navigation is dangerous because icebergs and field ice drift south off Newfoundland. In addition, fogs appear and get thicker and more frequent as summer advances. The Fall is the best time of the year, but even then the gales have started to appear. In the Eastern^{North} Atlantic, there is no ice to bother one, but fog, haze and mist can be counted on for most of the year. Generally speaking, the summer is the best season in the east.

SHOW #26 (B38-311) and #27 (B41-680)

Normally, the Atlantic Ocean between the United States and Newfoundland on the west, and the British Isles and Straits of Dover on the east, contains the busiest network of trans-oceanic cables in the world. Most of these cables have been laid between the Avalon Peninsula in Newfoundland in the west to Eire in the east, as the distance is the shortest, many of the cables run between two sections of the British Empire, and most of the cables from New York are laid to Newfoundland before crossing the Atlantic because that large island lies in the great circle route between New York and the British Isles. At the present time, the United States owns or leases all the cables between Europe and North America except those; from Halifax to Harbor Grace to Land's End, from Halifax to the Azores, from Halifax to

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SHOW #38 (838-311) and #37 (841-380)

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between New York and Europe. The United States owns or leases the cables between Europe and North America, except those from Halifax to Harbor Grace and from Halifax to the Azores, from Halifax to

No. 28.

Bermuda thence south, from Cape Cod to Brest, and one from New York to the Azores. In addition to the above, the United States owns or leases all the cables except that between Halifax and St. Johns, Newfoundland, which connects Nova Scotia and the Avalon Peninsula. Thus there is adequate cable communication across the North Atlantic. The British Isles had, until the present war started, cable communications to all the large countries in Europe, plus the British (RED) and Danish (BROWN) cables to Reykjavik in Iceland via the Orkney, Shetland and Faeroe Islands. The black dots on the slides indicate the commercial radio stations in the various countries in this strategic area. The area is well covered west and east, and also there are several stations in Iceland and Greenland. It may be remembered that a Norwegian trawler captured some Germans who were alleged to be enroute to Greenland for the purpose of establishing control of the radio stations in that country. The Norwegian weather stations in northeast Greenland have shut down their radio weather transmissions so that Germans patrolling west of the British Isles may not have this important information.

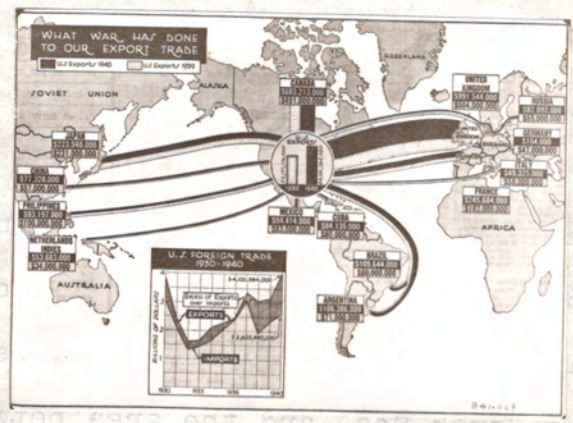
CUT #26 and #27. SHOW #28 (B41-681)

Here is shown, tinted in red, the waters of the North Atlantic within our area which can be mined, 500 fathoms being the maximum mineable depth. In the Western North Atlantic, principally around Newfoundland and in the Gulf of St. Lawrence, mining is a seasonable job, and limited by the presence of ice

in the winter and spring, and strong currents in the narrower inlets and bays. Mining in the western North Atlantic will therefore be employed largely for special operations, and for security and defense in the summer. Those harbors unaffected by ice can mine for security and defense all year, except when limited by strong tides. In the Bay of Fundy, the enormous rise and fall of tides, as much as 25 feet, will limit the use of mines to special types. Mining off Greenland and Iceland is also a seasonal job due to the ice conditions in that area.

In the eastern North Atlantic where ice is not found, and currents are not great, except in certain locations, mining is practically unlimited in the areas shown in red. Note the mineable area of the North Sea, and the area between Iceland and the British Isles. In the latter location the red area takes in the Rockall, Rosemary, Faeroe and Outer Bailey or Lousey Banks with an average depth of 300 fathoms or less over most of that area. The Faeroe Bank has a minimum depth of 48 fathoms, while Rosemary Bank has a minimum depth of 258 fathoms over it. As the waters in this part of the North Atlantic have been well surveyed, the depths and contours of these banks should aid navigation in thick weather. Other than Sable Island off Nova Scotia; Iceland; Rockall Island west of; the Faeroes north of, and the Shetlands northeast of the British Isles, there are no navigational dangers in the North Atlantic, unless we also consider the ice fields of the Arctic.

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No. 29

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 and the British Isles. In the latter location the red area
 takes in the Rockall, Rosemary, Feroe and Outer Bailey or
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 over most of that area. The Feroe Bank has a minimum depth
 of 40 fathoms, while Rosemary Bank has a minimum depth of 250
 fathoms over it. As the waters in this part of the North
 Atlantic have been well surveyed, the depths and contours
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 the North Atlantic, unless we also consider the ice fields
 of the Arctic.

Let us next consider the North Atlantic trade routes from the United States and Canada, to Northern Europe and the British Isles.

SHOW #23 (B38-312) and #29 (B41-669)

During normal peace times this route is the busiest and richest in the world. Even today, under present war conditions, and the restriction on United States shipping resulting from the "Neutrality Act", the United States exports have shown a large increase over the previous ten years, while the imports are not lagging far behind. The slide on the right is a graphic representation of our export trade in 1940 compared with the pre-war year of 1939. Note that our trade with Germany, Italy and Japan is the only part of our total foreign trade that has decreased. Of course, that with France has also dropped, although the figures as shown indicate the trade prior to the collapse of that country. It is sufficient to say that the slide readily indicates the importance of the North Atlantic in the economic and trade relations of the United States with the other major countries of the world. 30% of our trade passes over this route. In addition, under the present set-up, we must also consider the great amount of Canadian-United Kingdom trade that traverses this important area.

Thus, in controlling the trade of this great trans-Atlantic route, there are three main focal points: off

Newfoundland, off southwestern British Isles, and the northwestern approach to the British Isles. In protecting these focal areas, we can base the escort vessels close to each area. There are no flanking positions which have a favorable relative position. Even Iceland and Greenland are too far away to be of any real value for surface craft, but can be used for patrolling aircraft. Trade from the United States can pass close to Newfoundland and Nova Scotia if the great circle track is used, otherwise it must pass to the south, 400 miles away, due to ice conditions in the spring. In either case, bases in Newfoundland or Nova Scotia would have more favorable relative positions than any in the United States, for our nearest subsidiary base - Portsmouth - is 900 miles from the focal area off the Grand Banks. Other United States bases are at greater distances. In overcoming this deficiency, the new United States bases at Placentia Harbor and St. Johns, Newfoundland, obtained from the British, are of great value for the protection of trade, as well as being outposts for defensive measures against any threat to the Western Hemisphere via the North Atlantic. In the Eastern North Atlantic, the established bases in Great Britain have favorable relative positions as do those in Eire, but until near the British Isles, trade must travel two-thirds of the distance across the Atlantic with no supporting bases except possibly Iceland, if it should be necessary to divert the

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No. 30.

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 near the British Isles, trade must travel two-thirds of the
 distance across the Atlantic with no supporting bases except
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trade route a great deal farther to the north.

CUT #23 and #29

In considering this whole area of the North Atlantic, it is pertinent to the study to discuss at least some of the developed and possible main and subsidiary bases in both the eastern and western part. There are many bays, harbors and locations that in time could be developed as bases, but the scope of this paper does not permit of discussing all in detail.

Let us examine the western part of our area.

SHOW #30 (B41-759)

The coasts of Labrador and Greenland are bleak, rocky, and contain many indentations, or fiords. These coastlines have not been charted extensively, and the information on hand is meager for that part to the northward of the Straits of Belle Isle. There are many deep bays with cliff-like shore lines, which in combination with the cold climate, ice, fog, storms, outlying dangers of rocks, and exposure to the sea of most of the harbors, discourage their use by naval vessels, particularly when better locations are close by to the southward. Labrador and Greenland are little populated. Considering Mahan's three principal conditions for the strategic value of a base, we find that in the far north there are no places that have resources, they are too far

trade route a great deal farther to the north.

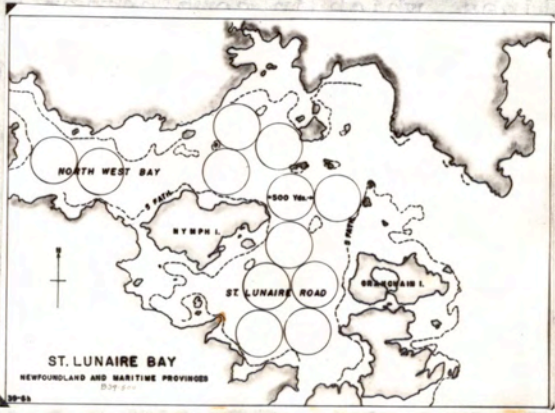
OUT W23 and W29

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No. 31.



No. 32.

there are no places that have resources, they are too far

away to have any ^{great} advantage of position, and they have no military strength. Their natural conditions of bluff shores, rough country, high lands, and glacial and field ice give them considerable defensive strength during most of the year.

Newfoundland has many harbors and bays along its coast, but in general they suffer the same drawbacks as those in Labrador, although to a lesser degree. Newfoundland does have some sheltered harbors which possess much natural strength. The fog, ice, rocks, deep water and heavy seas still persist. Most of the inhabitants are settled on the Avalon Peninsula, although there are many other sparsely settled and isolated communities elsewhere. Most of the people of Newfoundland are fisher folk, fish being their main subsistence. Communication between settlements is poor, and in some cases non-existent, and the more densely populated east coast of the island depends on shipments of supplies from the comparatively nearby port of Halifax and other Canadian St. Lawrence River ports on the mainland.

CUT #30

Starting from Northern Newfoundland, we will now look into the harbors of any size that are most suitable to our needs if we should be required to operate in the western part of this northern area.

SHOW #31 (B39-482) and #32 (B39-500)

A good small base for the control of the Belle Isle Straits and the entrance to Hudson Bay, located on the east coast of the northern tip of Newfoundland, is St. Lunaire Bay. This small sheltered harbor can accommodate about 12-500 yard berths in less than 25 fathoms of water with good holding ground. It is frozen over from November to May, and nets must be taken up at the beginning of the winter's freeze. Small seaplanes can take off in the Bay, but a good deal of clearing and levelling would be required for the use of land planes. There are no resources. The harbor is not exposed to torpedoes, and it is not beyond enemy gun range. There are 21 days of gales, and 57 days of fog. However, this Bay is convenient and suitable for the summer's work of controlling Belle Isle Strait and the trade through Hudson Bay to the town of Churchill. It can be classed as a small temporary, subsidiary base site for cruisers, destroyers, submarines or air.

CUT #32. LEAVE #31 SHOWING

Just to the north and south of St. Lunaire Bay are Pistolet Bay and Hare Bay, respectively. These two bays might be called alternate bays for this area. They are larger than St. Lunaire Bay, Hare Bay being large enough to anchor a large fleet temporarily. There are no resources near these bays, their entrances are wide, and except for greater size, and greater distance from the sea in the case

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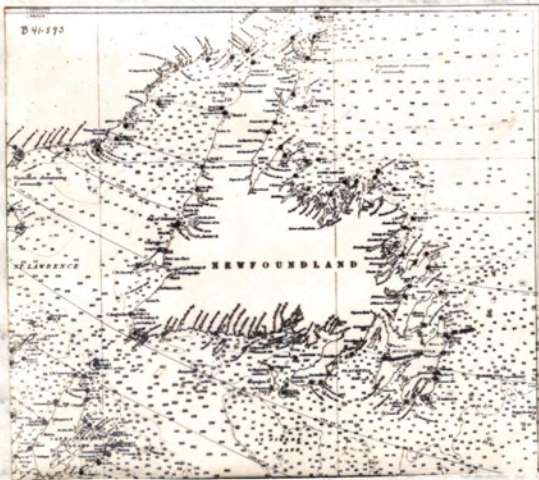
No. 33

are 21 days of rain, and 67 days of fog. However, this Bay is a summer's work of control- made through Hudson Bay to classed as a small tempo- nists, destroyers, sub-

No. 34



OUT 433. LEAVY 31 SHOWING



No. 35

Just to the north and south of Pistol Bay and Fox Bay, there might be called also a bay larger than St. Lawrence Bay, to anchor a large fleet tempo- near these bays, their entrance Greater also, and greater di-

of Hare Bay, offer no other advantage.

SHOW #31 (B39-482) and #33 (B41-727)

Almost half-way down the east coast of Newfoundland is the town of Botwood on the Bay of Exploits. This sheltered area is the first Canadian refueling point of the Imperial Airways North Atlantic Air route when in operation. There is a railroad connection at Norris Arm, four miles to the southward of Botwood which runs to St. John's. The water area available for take-offs and landing is about two miles in diameter. Tenders can anchor off the town. Larger take-off areas are found about 10 miles to the northward in other parts of the Bay of Exploits. The British have built a large seaplane base on Gander Lake twenty miles to the southeast of Norris Arm and a large landing field just to the north of the east end of Gander Lake near Benton. These facilities have been primarily built for delivery, via the North Atlantic air route, of military planes to Great Britain. Botwood is frozen over during the winter, but it does provide a seaplane base and surface vessel anchorages in the summer after the field and harbor ice have disappeared.

CUT #31 and #33. SHOW #35 (B41-593) and #34 (B41-592)

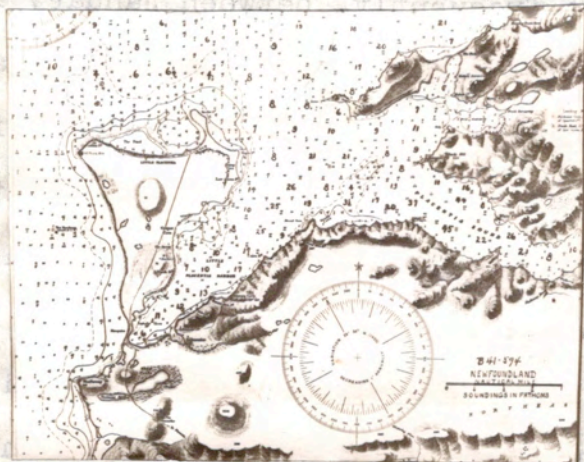
Next we come to the well known Harbor of St. John's. This harbor in Newfoundland, there being another on the

Bay of Fundy in New Brunswick, has enough space for about 7 destroyer berths and for small seaplanes to take off. As you know the United States is constructing a Naval base on the north side of the harbor which will include wharfage for handling supplies. This area is shown shaded in blue. The harbor is sheltered from most winds, but a swell is felt near the entrance after an easterly storm. The maximum depth is 18 fathoms, with 7 fathoms at the entrance. The harbor is frozen over occasionally for a week at a time. Field ice blocks the entrance frequently, between January and April, for varying lengths of time. Vessels at anchor are not exposed to torpedo fire. St. John's is on the Newfoundland Railroad. It has one graving dock with a capacity for cruisers, and a small floating drydock which can take minesweepers and tugs.

55 inches of rain fall during the year, and there are 7 days of gales and 37 days of fog annually. This port is suitable for destroyers, submarines, land and small seaplanes. Large repairs can be made, and small amounts of fuel oil, coal and general stores are kept on hand. Just to the north of St. John's is Quidi Vidi Lake. Here the United States Army is establishing a defensive force site, with facilities for aircraft, and shown shaded in blue on the slide. The British have established a sea plane base on the western end at St. John's.

CUT #35 and #34. SHOW #31 (B39-482)

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 7 destroyer berths and for small airplanes to take off. As
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 frozen over occasionally for a week at a time. Field ice



No. 36.

blocks the entrance... for varying lengths... posed to torpedo... Railroad. It has... cruisers, and a... sweepers and tugs... 25 inches of... 7 days of gales... suitable for destroyers, submarines and small sea-
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 the slide. The British have established a sea plane base
 on the western end of St. John's.

CUT 433 and 434. SHOW #21 (E33-432)

An emergency landing field is located near Harbor Grace 25 miles west of St. John's on a spur of the railroad. A small seaplane site with good anchorage is located on Lady Lake about 1/4 mile north of Harbor Grace Airport.

To the north and south of St. John's are Trinity Harbor and Bull's Bay respectively. These small harbors are suitable for destroyers and submarines, but as they have few resources they can be only temporary. They are, however, on the Newfoundland Railroad and connect with St. John's. Only Bull's Bay has an advantage over St. John's, as this bay is often free from ice when St. John's is ice-bound. It is therefore primarily a stand-by anchorage.

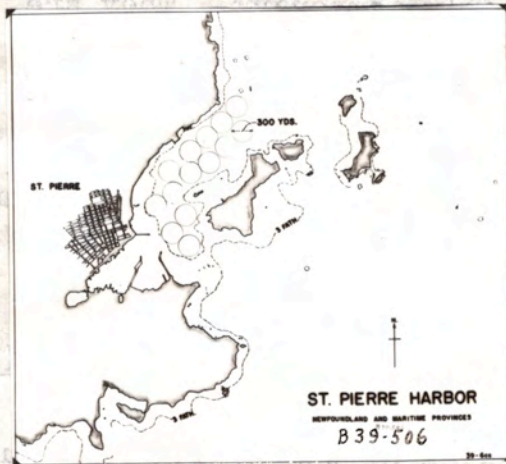
CUT #31. SHOW #35 (B41-593) and #36 (B41-594)

On the western side of the Avalon Peninsula, and also on the eastern shore of Placentia Bay, is Little Placentia Harbor. This harbor, southeast of Argentia Peninsula, has an anchorage area of about one and one-half square miles, with depths of from 6-25 fathoms of water. The entrance is about three-quarters of a mile wide, but can be netted when ice is not present. This Harbor sometimes freezes early in February, but only in severe winters - about every six or eight years. The ice breaks up about the first of April. Northern field ice generally arrives in March and remains three or four weeks. Fogs are more prevalent along the south coast of Newfoundland than elsewhere on the island.

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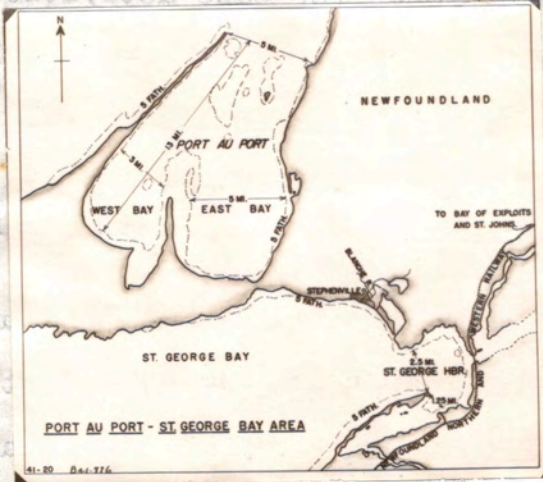
No. 37.

The area colored blue is plotted from the latest information as to where the United States has obtained a site primarily as an air base and Army training ground. Seaplanes can take off in this area and a landing field will be constructed on the ground to be conditioned for base activities. Little Placentia Harbor is two miles from the Newfoundland Railroad branch to Placentia Harbor, just to the south.

CUT #35 and #36. SHOW #31 (B39-482) and #37 (B39-506)

Close to the south central shore of Newfoundland lie the only northern remains of France's one-time North American Empire - Great and Little Miquelon and the Island of St. Pierre - three small islands. These islands are valuable to France for three reasons. They allow her to retain and use fishing rights; they could serve as the Western base of a French North American-European Air route, and there is one useful harbor of moderate size, St. Pierre. In the roadstead there is room for about 14-300 yard berths in less than 14 fathoms of water. The harbor is exposed to the Northeast and Southeast, but it is sheltered from the usual Northwest and Southwest winds. The climate is cold and foggy, with field ice present in February and March, although the harbor seldom freezes over. This site is suitable for destroyers, submarines, motor torpedo boats, and small seaplanes. St. Pierre has a small naval base and is the headquarters for French Naval Units when in New-

The area colored blue is plotted from the latest information as to where the United States has obtained a site primarily as an air base and Army training ground. Seaplanes can take off in this area and a landing field will be constructed on the ground to be considered for base activities.



No. 38.

three small islands. These islands are valuable to France for three reasons. They allow her to retain and use fishing rights; they could serve as the western base of a French North American-European Air route, and there is one useful harbor of moderate size, St. Pierre. In the roadstead there is room for about 14-200 yard berths in less than 14 fathoms of water. The harbor is exposed to the Northeast and Southeast but it is sheltered from the usual Northwest and Southwest winds. The climate is cold and foggy, with field ice present in February and March, although the harbor seldom freezes over. This site is suitable for destroyers, submarines, motor torpedo boats, and small seaplanes. St. Pierre has a small naval base and is the headquarters for French Naval Units when in New-

foundland and the northwest Atlantic. There are four small marine railways here having capacities from 100 to 600 tons. There are minor resources.

CUT #31 and #37. SHOW #35 (B41-593) and #38 (B41-776)

The last area of importance in Newfoundland is the Port-au Port-St. George Bay and Harbor Area, located in the southwest corner of the island. St. George's Bay and Harbor is an open roadstead, although some shelter is afforded from the usual N.W. winds, but is open to the S.W. winds. The Harbor has greater protection for the small force that can be accommodated. St. George's Bay and Harbor have fair holding ground, but the harbor is subject to squalls during fresh easterly winds, and a swell is felt with westerly ones. River ice collects in the Bay from January to April or May. It gets its share of storms and has about 28 days of fog. The United States has selected a small area of about one square mile, to the east of Stephenville, as indicated by blue on the slide. This is to be used as an air base. St. George Harbor is close aboard the Newfoundland Northern and Western Railroad which connects with the Bay of Exploits (Botwood) and St. Johns.

Just to the northward of St. George's Bay and close aboard is Port au Port Bay. This bay is large and long, with the smaller East and West bays at the southern end.

The whole bay is sheltered from all directions except North. It is frozen over from January to April. There are no resources nor facilities in this area at present.

CUT #35 and #38. SHOW #31 (B39-482)

A brief description of the Gulf of St. Lawrence and its four entrances should be in order at this time. This body of water covers an area of 100,000 square miles. The four entrances are: Strait of Belle Isle in the northeast, Cabot Strait, the main entrance from the eastward, the Gut of Canso to the southeast, and the St. Lawrence River from the westward.

The Strait of Belle Isle, separating Labrador from Newfoundland, is only navigable from July to October. It is 75 miles long, 9 miles wide at its narrowest point, has precipitous soundings, many rocks along shore, fog, ice and strong currents, all of which make the Strait dangerous to navigate except under good weather conditions.

Cabot Strait, the principal entrance, lies between Newfoundland and Cape Breton Island. It is 55 miles wide, and is seldom frozen over, but from July to May navigation is not practical due to the heavy drift ice. In the spring, the rush of ice to sea through the Straits is so great that a bridge of ice is often formed between Cape Ray, the Southwest corner of Newfoundland, and St. Paul Island to the Southwest, often lasting for three weeks. River ice may be encountered in Cabot Strait from January to June. There is

The whole bay is sheltered from all directions except North. It is frozen over from January to April. There are no resources nor facilities in this area at present.

CUT #33 and #32. SHOW #31 (B39-482)

A brief description of the Gulf of St. Lawrence and its four entrances should be in order at this time. This body of water covers an area of 100,000 square miles. The four entrances are: Strait of Belle Isle in the northeast, Cabot Strait, the main entrance from the eastward, the Gut of Canso to the southeast, and the St. Lawrence River from the westward.

The Strait of Belle Isle, separating Labrador from Newfoundland, is only navigable from July to October. It is 75 miles long, 3 miles wide at its narrowest point, has pre-



No. 39.

cipitous soundings, many strong currents, all of which navigate except under good Cape Strait. Newfoundland and Cape Breton is seldom frozen over, but not practical due to the the rush of ice to sea through the Straits is so great that a bridge of ice is often formed between Cape Ray, the South-west corner of Newfoundland, and St. Paul Island to the South-west, often lasting for three weeks. River ice may be encountered in Cabot Strait from January to June. There is

also plenty of fog.

The narrow body of water called the Gut of Canso separates Cape Breton Island from Nova Scotia. It is closed by ice from January to April. The Gut is 14 miles long and 900 yards wide, making a deep channel with strong currents. After leaving the Gut of Canso a vessel can either turn into the Gulf or go through Northumberland Strait, which separates Prince Edward Island from Nova Scotia and New Brunswick. This Strait is 160 miles long and 5 miles at its least width, with a minimum depth of 6 fathoms. Dense fogs are seldom found in this Strait.

CUT #31

Although there are several good bays and harbors in the Gulf of St. Lawrence such as Gaspé Bay and Chaleur Bay in the western part large enough for a fleet, their relative position makes them of less importance than others closer to our trade lanes, and not so restricted by weather conditions.

SHOW #31 (B39-482) and #39 (B39-486)

Sydney Harbor, on the northeast coast of Cape Breton Island, has room for many 600 yard berths in 6-9 fathoms. The holding ground is excellent. It is frozen over in January and February and field ice blocks the entrance sometimes in the spring under pressure of a Northeast wind. There are many wharves, large repairs can be made, and there is a marine railway of 1200 ton capacity. 8 days of gales, 25 days of

also plenty of fog.

The narrow body of water called the Gut of Canso separates Cape Breton Island from Nova Scotia. It is closed by ice from January to April. The Gut is 14 miles long and 900 yards wide, making a deep channel with strong currents. After leaving the Gut of Canso a vessel can either turn into the Gulf or go through



VIEW OF HALIFAX, NOVA SCOTIA
From Citadel, Air Force Photograph
B 38-313

Northumberland Strait, which Nova Scotia and New Brunswick and 5 miles at its least width fathoms. Dense fog sets in

No. 40.

CUT 431

Although there are several good bays and harbors in the

the Bay and Chaleur Bay in the west, their relative position in others closer to our trade weather conditions.

No. 41.

33 (B39-486)



HALIFAX HARBOR
B30-250

east coast of Cape Breton



B39-490
BEDFORD BASIN

Island, has room for many 600 yard The holding ground is excellent. ary and February and field ice plo in the spring under pressure of a many wharves, large repairs can be railway of 1200 ton capacity.

No. 42.

fog and 51 inches of rain occur during the year. The maximum fog occurs in May with other such days being spaced fairly evenly throughout the year. The harbor can be mined and netted, but these must be removed when the winter freeze starts to block the harbor with ice. Only medium sized planes can take off in the restricted harbor under all conditions. This harbor may be classed as a good subsidiary base. The United States had an air station here during the World War to combat submarine.

CUT #39. SHOW #31 (B39-482) and #40 (B38-313)

We next come to Nova Scotia on the continental mainland. The climate here is milder than Newfoundland and the ice and fog conditions are better. Our first base here, and the best in the western part of our North Atlantic area, is Halifax, half way down the coast.

CUT #31 and #40. SHOW #41 (B30-250) and #42 (B39-490)

Here we have a large harbor of some 10 square miles of water area to which an inland anchorage can be added, the Bedford Basin of some 10 more square miles. The depths of the harbor proper do not exceed 17 fathoms, with excellent holding ground. All types of planes can be accommodated. The harbor can be mined and netted. It is seldom frozen over and drift ice blocks the entrance very little. It can be classed as an all-year port of fine capabilities.

log and 51 inches of rain occur during the year. The maximum fog occurs in May with other such days being spaced fairly evenly throughout the year. The harbor can be mined and netted but these must be removed when the winter freeze starts to block the harbor with ice. Only medium sized planes can take off in the restricted harbor under all conditions. This harbor may be classed as a good subsidiary base. The United States had an air station here during the World War to combat submarine.

OUT #39. (B39-318)



No. 43.

OUT #31 and #40. (B39-490)

Here we have a large harbor of some 10 square miles of water area to which an inland anchorage can be added, the Bedford Basin of some 10 more square miles. The depths of the harbor proper do not exceed 14 fathoms, with excellent holding ground. All types of planes can be accommodated. The harbor can be mined and netted. It is seldom frozen over and drift ice blocks the entrance very little. It can be classed as an all-year port of fine capabilities.

There is a 30 by 570 foot drydock and four marine railways, the largest capable of 3,000 tons. A Canadian naval base and dockyard is located here. Halifax can be defended against enemy attacks. It is a desirable main base site for operations in the northwestern Atlantic. It has good rail and road connections. Halifax averages 57 inches of rain, 29 days of fog, and 54 gales a year. The percentage of gales is somewhat higher here than in other harbors in the area.

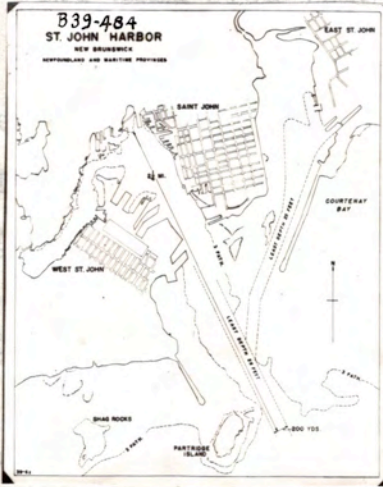
CUT #41 and #42. SHOW #31 (B39-482) and #43 (B39-489)

Not far to the southward of Halifax are two bays - St. Margaret and Mahone Bay. St. Margaret Bay is here shown, as it is the better of the two. Either could be used as subsidiary bases, as they are sheltered from the usual winds and storms, although exposed somewhat to the southward. Halifax overshadows these as a permanent base. St. Margaret Bay could be particularly useful as a supporting seaplane base. A road to Halifax passes near the head of the Bay.

CUT #43. LEAVE #31 showing

Coming now to the Bay of Fundy, which separates Nova Scotia and New Brunswick, we encounter enormous tides caused by its shape and depth. Tides range from 20 feet at the southern end to 45 feet in the northern narrow reaches of the Bay. This, coupled with shoals at the entrance, and

There is a 50 by 500 foot drydock and four marine railways, the largest capable of 3,000 tons. A Canadian naval base and dockyard is located here. Halifax can be defended against enemy attacks. It is a favorable base site for operations in the northwestern Atlantic. Halifax receives 54 gales a year and 54 gales a year higher here than elsewhere.



No. 44.

Not far to the south of St. John are two bays - St. Margaret and Melrose Bay. St. Margaret Bay is here shown as it is the better of the two. Either could be used as subsidiary bases, as they are sheltered from the usual winds and storms, although exposed somewhat to the southward. Halifax overshadows these as a permanent base. St. Margaret Bay could be particularly useful as a supporting seaplane base. A road to Halifax passes near the head of the Bay.

OUT #43. LEAVE #51 showing

Coming now to the Bay of Fundy, which separates Nova Scotia and New Brunswick, we encounter enormous tides caused by its shape and depth. Tides range from 50 feet at the southern end to 45 feet in the northern narrow reaches of the Bay. This, coupled with shoals at the entrance, and

fog for days at a time, make navigation difficulties complete.

SHOW #31 (B39-482) and #44 (B39-484)

Although there are a few harbors in the Bay of Fundy such as St. Mary's Bay, Annapolis Basin and L'Etang Harbor, large and deep enough to accommodate many naval vessels, the most important is St. John, New Brunswick. This port is a great shipping center and a main terminal of the Canadian Pacific Railroad. There are 40 or more wharves. Vessels anchoring out are exposed to the south, but alongside the docks large repairs can be made. There is a 1150 foot drydock with 40 feet on the sill, and three marine railways. The location of this drydock is important, for it is at present one of two on the east coast of North America which can take a battleship with a 40 foot draft due to underwater damage. The other is at Boston. All the others have too shallow channels, or the distance to the dock from deep water is so great that vessels cannot make it during one high water. Although St. John is an all-year harbor, it has 54 days of gales, and 44 days of fog a year. In view of the facilities and large amount of supplies, this harbor can be used as a subsidiary base for surface vessels and land planes, and a repair base for capital ships as well as smaller types.

CUT #31 and #44

log for days at a time, make navigation difficulties complete.

SHOW #31 (232-432) and #44 (232-434)

Although there are
 as St. Mary's Bay, Ann
 and deep enough to acc
 important is St. John
 shipping center and a
 Railroads. There are
 ing out are exposed to
 large repairs can be m



No. 45

The
 location of this drydock is important, for it is at present
 one of two on the east coast of North America which can take
 a battleship with a 40 foot draft due to underwater damage.
 The other is at Boston. All the others have too shallow
 channels, or the distance to the dock from deep water is so
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 repair base for capital ships as well as smaller types.

CUT #31 and #44

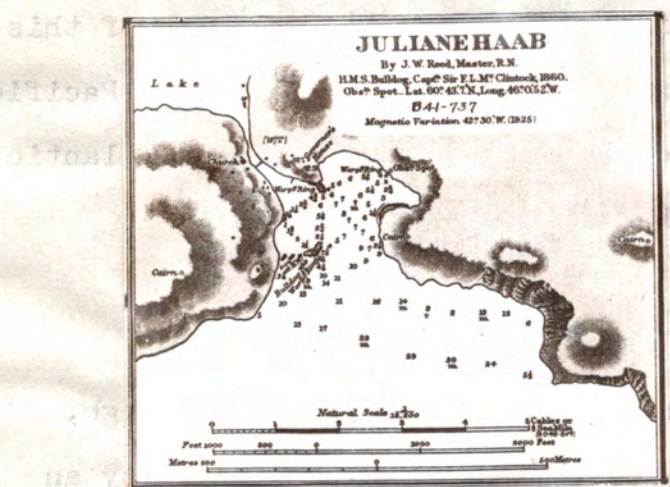
Proceeding northeastward, let us next examine the possibilities of Greenland for strategic locations. The position of this large island in the Atlantic is analagous to Alaska in the Pacific. It is an outpost against advance by air across the North Atlantic and Arctic Regions to the North American continent.

SHOW #30 (B41-759) and #45 (B41-710)

This large island is a plateau 6,000 to 10,000 feet high, covered, except at the very edge of the surrounding seas, by an unbroken ice-cap, which averages 1,000 feet or more thick. Vast ice-streams or glaciers flow continuously from the inland-ice into the adjacent seas, mostly through the many fiords. The temperatures of southern Greenland average about 44° in summer and 12° in winter. The farther north, and on the ice-cap they are much lower. The only ice-free regions are barren coast lowlands and outlying islands. Cattle and sheep are raised on the good hay lands and pastures around the fiords in the southwestern part, principally Julianehaab. The chief industries are curing skins, sea-animal oil and the cryolite quarried at Ivigtut which amounts to 20,000 tons a year, about half going to the United States. The right hand slide shows the Lindberghs exploration flight of 1933 and gives a good idea of the air coverage that can be developed over and around this large island, even though ice-capped.

In order to get a good picture of this land, which I am sure none of us have seen, let us brief this air trip and rearrange the order of stops, so that we may continue to the Eastern

Proceeding northward, let us next examine the possibi-

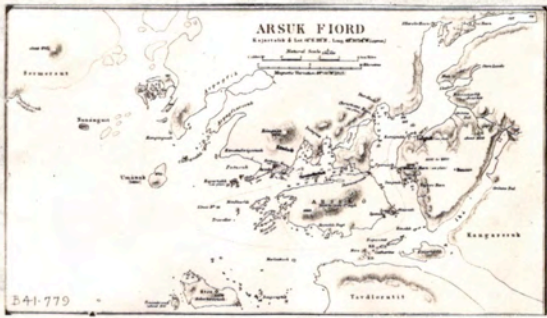


No 46.

ice-streams or glaciers flow continuously from the inland-ice. The terrain is broken up by many fjords. The terrain is broken up by many fjords. The terrain is broken up by many fjords.

into the part, principally Julianehaab. The chief industries are curing skins, sea-animal oil and the crystals quarried at Ivigtut which amount to 20,000 tons a year, about half going to the United States.

No. 46a.



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Atlantic.

CUT #30. SHOW #45 (B41-710) and #46 (B41-737)

Here we have the only forest in Greenland, which is just south of Julianehaab. This port is 800 miles a little east of north from St. John's, Newfoundland. This part of Greenland has the most temperate climate all year round, and although there are many coastal areas free of ice, the terrain, being of rock, is rough and uneven. This port has a small harbor large enough for a small tender and several seaplanes. There is a small 100 foot beach. As the harbor is nestled among many islands not shown on the slide, it is well protected from all directions except from Southwest swells, but even then there is sufficient lee for landing and taking off. A large lake northwest of the town has possibilities for aircraft. This harbor is open from May to December. There are no places for landing fields in this area. There is a radio station here.

CUT #46. SHOW #45 (B41-710) and #46a (B41-779)

Passing over Arsuk Fiord, 90 miles to the north, we see that it is large enough for about 3 battleships with 17-23 fathoms of water and good holding ground in Torssukatak Bay area. The bay and Fiord are well protected and rarely encumbered by icebergs. However, this fiord, on which is situated the mining town of Ivigtut, is closed from April to December. During the open season there are no swells and protection is excellent. Shifts of

Atlantic.

CUT 430. SHOW WAS (P. 11)



No. 47.



No. 48.



No. 49.

CUT 430. SHOW WAS (P. 11)

Passing over Frankford,

it is large enough for about 5

water and good holding ground in Torasvika Bay area. The bay

and fjord are well protected and rarely encumbered by icebergs.

However, this fjord, on which is situated the mining town of

Ivigtut, is closed from April to December. During the open sea-

on there are no swells and protection is excellent. Ships of

winds within the fiord must be watched for, due to the high surrounding cliffs. There is a sandy beach in Ekaluit Bay about 400 feet long, and about 18 planes can be anchored in the bay in 2 to 30 fathoms of water. There is plenty of take-off area. It is possible to construct a landing field here, but approaches thereto would be poor.

CUT #45 and #46a. SHOW #47 (B41-711) and #48 (B41-712)

The left slide shows the inner or storm harbor at Godthaab, 100 miles northwest of Ivigtut. Here the United States now has Consular representation. The harbor is small and open the entire year. It is large enough for a tender and about six seaplanes. There is a radio station. There is no location for a landing field. Holding ground is good and there is plenty of take-off room. The slide on the right shows the edge of ice-cap enroute from Godthaab to Holsteinsborg. Where the ice-cap does not actually touch the sea coast, it generally melts during the summer months forming lakes along its edge if the terrain so permits. These make good emergency landing places, except for the fact that they are miles from civilization and there are no roads out. It is either fly out or spend days attempting progress over barren rocky country.

CUT #47 and #48. SHOW #45 (B41-710) and #49 (B41-715)

Holsteinsborg Harbor is similar to all others in Greenland, merely the sea-end of fiords into which in summer rush the waters

winds within the fiord must be watched for, due to the high sur-
rounding cliffs. There is a sandy beach in Ekaint Bay about
400 feet long, and about 18 planes can be anchored in the bay in
2 to 30 fathoms of water. There is plenty of take-off area. It
is possible to construct a landing field here, but approaches



841-773
Photograph by Charles and Anne Lindbergh

No. 50.

The left side of the fiord is a steep, rocky slope. The
100 miles northwest of Iqaluit. The
General representation. The



841-774
BLACK MOUNTAIN PEAK JAGGED POINT THRU THE SNOW AND ICE, Iqaluit, Greenland. Photograph by Charles and Anne Lindbergh

No. 51.

There is plenty of
the edge of ice-cap
Where ice-cap does
usually melts during the
of the terrain so



841-772
Photograph by Charles and Anne Lindbergh

No. 52.

These make good emergency landing places, except for
the fact that they are miles
roads out. It is either fly
Gress over barren rocky ground

Holstenborg Harbor is similar to all others in Greenland,
merely the sea-end of fiords into which in summer fresh waters

of the melting ice-cap and in winter - December to May, frozen over. This small harbor has a radio station, and is one of the best. It has good holding ground, can accommodate a squadron of seaplanes and tender, but has no resources, nor can a landing field be constructed. All of these harbors could be readily defended, mined and netted, but nets must be taken up before the harbors freeze. All supplies must be imported at Holsteinsborg, except fish which abound.

CUT #49. SHOW #45 (B41-710) and #50 (B41-713)

The right hand slide shows Jakobshavn Glacier where it enters Disko Bay. Thus are born some of the icebergs that, weeks later, cause so much trouble off the Grand Banks.

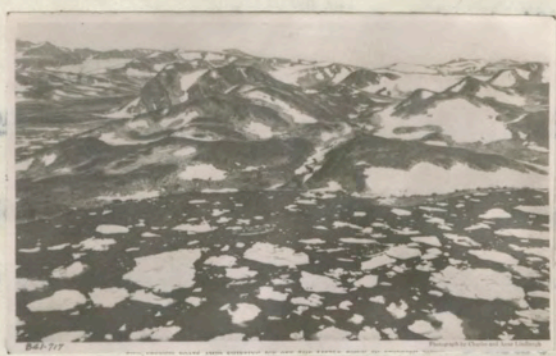
CUT #45 and #50. SHOW #51 (B41-716) and #52 (B41-718)

These two pictures show in general the West and East Coast terrain of Greenland, surrounding the broad expanse of ice which covers 84 per cent of the island. Note the black streaks in the glacier of the right hand slide. They are parts of mountains torn away by the force of the glacier. Having crossed the broader expanse of Central Greenland, the first place of call is Ella Island. British and German expeditions spent the winter of 1930-31 on top the ice pack in latitudes 67° and 71° North respectively. It is reported that no undue hardships were experienced. Radio stations would probably have to be maintained in this vast area.



841-714 Photograph by Charles and Anne Lindbergh

No. 53.



CUT #50 (B41-713)

No. 54.



FOG VEILS THE MOUNTAINS NORTH OF KANGERDLUGSSUAK



841-719 Photographs by Charles and Anne Lindbergh
OVER TWO MILES HIGH AND UNCHARTED!

No. 55.



Next House in Ammassalik Are Built of Wood Brought from Copenhagen
In this photograph look down to a little cabin station. Fuel and some gear available, but there is no water and the little that exists is on the coast nearby.
Caption: Charles A. Lindbergh and his wife, Anne-Marie Lindbergh, with their son, Charles, and their dog, "Puffin", at the station in Ammassalik, Greenland, August 1926.

No. 56.

CUT #51 and #52. SHOW #45 (B41-710) and #53 (B41-714)

There is only a temporary anchorage at Ella Island for sea-planes, that, during the summer might find it clear of ice, which is seldom. If not frozen over, there is generally a great amount of drift ice. This is also true of Scoresby Sound to the south. In the summer months it is full of small icebergs, which do not melt or break up until striking the warmer water of the Atlantic. As usual, the terrain does not permit of landing fields. Sea-planes can not, as a rule, operate in this locality.

CUT #45 and #53. SHOW #54 (B41-717) and #55 (B41-719)

Scoresby Sound is unfit for surface naval craft or seaplanes even during the summer and fall months, as noted on the left screen. Vessels do enter in order to bring supplies to the personnel of the radio station, which is one of the most northern radio stations on the east coast of Greenland. The right slide shows the nature of the terrain enroute south to Angmagsalik.

CUT #54 and #55. SHOW #45 (B41-710) and #56 (B41-687)

The small harbor of Angmagsalik, 360 miles by air northeast of Julianehaab, is our last port in Greenland. It is about 400 miles, a little north of west from Reykjavik, Iceland. The inner harbor - lower right on the slide - is small; large enough, however, for mooring about 6 seaplanes. It is well protected, but planes must take off and land in the main part of the fiord

CUT #51 and #52. SHOW #15 (B41-VIO) and #33 (B41-VIA)

There is only a temporary anchorage at Ellis Island for sea-

planes, that, during the summer months, it is seldom that

of drift ice. This is also true in the summer months it is

melt or break up until it is a rule, operation

As travel, the terrain does not permit

planes can not, as a rule, operate



No. 57.

CUT #45 and #53. SHOW #25 (B41-VIO) and #26 (B41-VIO)

the naval craft or seaplanes

is located on the left

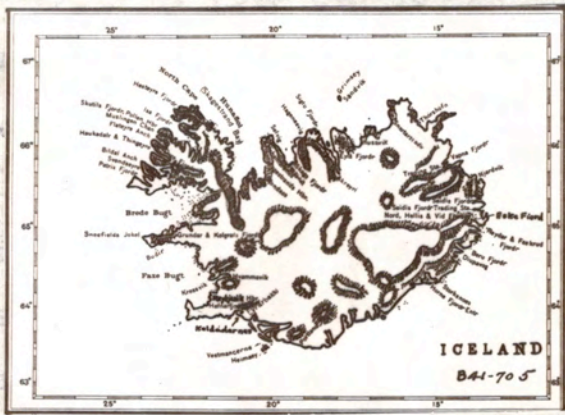
ing supplies to the per-

one of the northern

land. The right side

south to Angarsalik.

No. 58.



Scor

even drin

screen.

sonnel of

radio sta

shows the

CUT #54 and #55. SHOW #45 (B41-VIO) and #52 (B41-507)



The small harbor of Angarsalik

of Julianebsad, is our last port

miles, a little north of west fro

harbor - lower right

however, for morning about 6 sea

but planes must take off and land

No. 59.

Photograph by Charles and Anne Lindbergh
ICELAND'S VOLCANIC PLATEAUS CONTRAST WITH GREENLAND'S ICY PEAKS

outside. As the main fiord is too deep, a small tender can anchor in the inner harbor, which, however, might crowd the planes. This harbor is free from ice in September and October only. There is a radio station here. Angmagssalik is 1300 air miles from the present German occupied port of Bergen in Norway.

CUT #45 and #56

I have given you only a few of the harbors of Greenland, but there are many more which need exploration and survey before they can be classed as base sites. All should be kept under surveillance, and free from Axis penetration. We have seen in the newspapers, the recent decision of the United States to establish military forces in Greenland for just this purpose.

Let us now examine the eastern part of our area.

SHOW #57 (B41-760)

Crossing the Denmark Strait, the next place of strategic interest is the Island of Iceland, which at its closest, is only 200 miles from Greenland. Unlike Greenland, it has no ice caps, but one-eighth of its area in the south central part has glaciers.

CUT #57. SHOW #58 (B41-705) and #59 (B41-721)

Iceland is of volcanic origin, being mostly overlaid with lava. Being volcanic, there are many geysers which form natural sources of heat. Earthquakes occur, but infrequently. The high plateau covers nearly the entire island, sloping off to the sea,

outside. As the main land is too deep, a small tender can anchor in the inner harbor, which, however, might crowd the planes. This harbor is free from ice in September and October only. There is a radio station here. Ammassalik is 1300 air miles from the present German occupied part of Bergen in Norway.

CUT 743 and 750

I have given you only a few of the harbors of Greenland, but there are many more which need exploration and survey before they can be classed as base sites. All should be kept under surveillance, and free from Axis penetration. We have seen in the newspapers, the recent decision of the United States to establish military forces in Greenland for just this purpose.



SHOW

No. 60.

CUT 751, SHOW 457 (B1-705) and 459 (B1-751)

Iceland is of volcanic origin, being mostly overlaid with lava. Being volcanic, there are many geysers which form natural sources of heat. Earthquakes occur, but infrequently. The high plateau covers nearly the entire island, sloping off to the sea,

so that along the coast line there are again many indentations or fiords and lake areas, principally barren, but with what little vegetation ^{grows} there is [^] in these places. However, there are more numerous level areas along the coast where landing fields may be constructed. Iceland is by far, more adaptable for aircraft operations than Greenland although, again, the cold and dark of the winter months seriously handicap air activities of any kind. Compared with Greenland, Iceland temperatures are warmer. In winter the average is about 30°F and in summer about 50°F. There is rainfall all year averaging about 20 days monthly in the winter, and 14 days monthly in the summer. These rains are light, more like heavy fog and due primarily to the warmer air of the Atlantic Current striking the colder Arctic atmosphere. The main industries are agriculture and fishing. Coal is mined to some extent. Communications in Iceland are fairly good. There are many roads, bridges, automobile and 2,000 miles of telegraph and telephone lines.

CUT #59. SHOW #58 (B41-705) and #60 (B41-707)

As the Icelanders have never had any military force, naturally no defenses or aircraft facilities existed until the Canadians moved in shortly after the Germans took over Norway and Denmark. Iceland is now fast becoming well fortified, with the Canadian Headquarters at Reykjavik, the capitol, situated in the southwest corner of the island. Here, and at Kaldadarnes, 24 miles to the southeast, two landing fields are under construction,

as that along the coast line there are again many indentations of
 Florida and lake areas, principally barren, but with what little
 vegetation that grows in these places. However, there are more
 numerous level areas along the coast where landing fields may be
 constructed. Iceland is by far, more adaptable for aircraft
 operations than Greenland although, again, the cold and dark of
 the winter months seriously handicap air activities of any kind.
 Compared with Greenland, Iceland temperatures are warmer. In
 winter the average is about 30°F and in summer about 50°F. There



No. 61.

CUT 452. SHOW 453 (541-703) and 450 (541-707)

As the Icelanders have never had any military forces, natu-
 rally no defenses or aircraft facilities existed until the Canadi-
 ans moved in shortly after the Germans took over Norway and Den-
 mark. Iceland is now fast becoming well fortified, with the
 Canadian Headquarters at Reykjavik, the capital, situated in the
 southwest corner of the island. Here, and at Keflavik, 24
 miles to the southeast, two landing fields are under construction.

each with runways 1,000 yards by 50 yards in area. These are to be completed by June 1, 1941. The Canadians are reported to have heavily fortified Iceland. There are many lake areas along the southern coast that permit of seaplane landings, but require a great amount of construction work in building roads and facilities. Many fiords along the west and east coasts will take a large force in anchorages of from 5-25 fathoms, but, with the lack of facilities and resources, they can only be classed as temporary anchorages. One such fiord is Hval Fiord 10 miles north of Reykjavik.

CUT #58. SHOW #60 (B41-707) and #61 (B41-709)

Reykjavik Inner Harbor, with the few available facilities of the city, can be classed as a light force and submarine subsidiary base, although there is enough room to take several battleships. The depth of water in this harbor averages 5-16 fathoms over a 2 square mile area, with an unlimited anchorage in Faxa Bay to the north. The holding ground is good. The inner harbor is open to the north, but otherwise well protected. It can be netted and mined. There is a seawall with 25 foot depth near the city, which will take vessels up to 300 feet long. Three vessels can moor here at one time. There are facilities for small repairs in the city. Seaplanes can be anchored to the northeast in a protected anchorage, but a north wind creates considerable choppy water. There are no dry-docking facilities here, nor oil, but small amounts of coal are mined. There is plenty of fresh



No. 62.

CUT #53. SHOW #63 (941-707) and #61 (941-709)



No. 63.

water, sanitation is modern, and the city illuminated by electricity. There is a radio and cable station. The terrain around, and to the east of Reykjavik is mostly level, with a thin soil of volcanic origin which does not permit trees to grow. Thus the area is adaptable to large landing fields, which fact the Canadians are making use of as previously stated. This port is open throughout the year and has an average temperature of 39° F.

CUT #60 and #61. SHOW #58 ~~(B41-704) and (B41-705)~~ and #62 (B41-706)

As a sample of the eastern coast of Iceland, let us look at one of the better fiords, about which there is some information available. That is Reydar Fiord with Eske Fiord in the northwest part. This body of water including both Fiords has one of the largest protected areas for landings and take-offs for seaplanes on the coast. Eske Fiord, has a water area of about 2 square miles with depths of from 6-27 fathoms of water. This will accommodate a tender and a squadron of seaplanes. The water in central Reydar Fiord is too deep for an anchorage.

CUT #58. SHOW #62 (B41-706) and #63 (B41-722)

The harbor in Eske Fiord is well protected from all directions except southeast, from which direction the wind does not blow very often. The harbor can be netted and mined. The fiord is open all year round. There are no facilities here or any other place on the coast. However, there is a fishing village and Trading Station at the end of the fiord and good water is

water, sanitation is modern, and the city illuminated by elec-
 tricity. There is a radio and cable station. The terrain around
 and to the east of Reykjavik is mostly level, with a thin soil of
 volcanic origin which does not permit trees to grow. Thus the
 area is adaptable to large landing fields, which face the Canadi-
 an air making use of as previously stated. This port is open
 throughout the year and has an average temperature of 39° F.

CUT 450 and 451. (141-705) and



As a sample of the
 one of the better fish
 available. That is the
 part. This body of wa-
 largest protected area
 the coast. Back from
 with depths of from 6-27 feet.
 a tender and a squadron of seaplanes. The water in central
 Reykjavik is too deep for an anchorage.

No. 64.

CUT 452. SHOW 452 (141-706) and 453 (141-722)

The harbor in Bako Fjord is well protected from all direc-
 tions except southeast, from which direction the wind does not
 blow very often. The harbor can be netted and mined. The fjord
 is open all year round. There are no facilities here or any
 other place on the coast. However, there is a fishing village
 and Trading Station at the end of the fjord and good water is

plentiful. When German planes started investigating Iceland this past November, the Canadian air patrol was extended as far east as Seidis Fiord, 15 miles to the north of Eske Fiord. All of these fiords may readily be defended, but the task of preparing them for defense would be difficult.

CUT #62 and #63

We next come to the Faeroe Islands, built up of volcanic rock formed by streams of once molten basalt.

SHOW #57 (B41-760) and #64 (B41-724)

As these islands are located in the center of a triangle, Iceland - British Isles - Norway, with distances from 250 to 300 miles to each, they have a strategic position in guarding this area of the North Atlantic. These islands, of which there are 18, are separated by Sounds, running generally northwest to southeast and through which tidal currents run with great rapidity. Like all these northern lands, where the terrain is unsuitable for agricultural use, the chief industry is fish, including whales and seals. However, due to the nature of the soil, although barren, and the more or less constant moisture of the atmosphere, there is a small amount of agriculture and sheep raising. The islands are infested with birds which produce food and feathers.

The position of the Faeroes in the Gulf Stream or warm Atlantic Current which passes between Iceland and Norway gives them a mild but damp and unsettled climate. The sea never freezes,

When German planes started investigating Iceland
this past November, the Canadian air patrol was extended as far
east as Seidja Fjord, 15 miles to the north of Lake Fjords. All
of these fjords may readily be defended, but the task of prepar-
ing them for defense would be difficult.



No. 65.



No. 66.

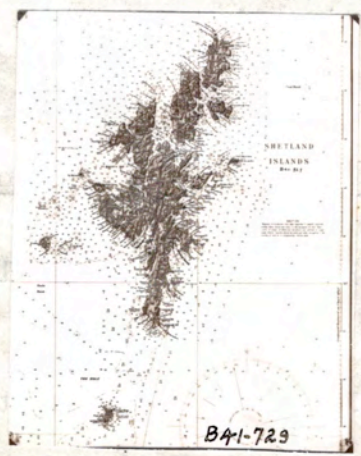
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miles to each, they have a strategic position in guarding this
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The position of the Feroes in the Gulf Stream or warm At-
lantic Current which passes between Iceland and Norway gives them
a mild but damp and unsettled climate. The sea never freezes,

the rainfall is large, particularly from October to March, and the fog is common from June to December. Snow falls about 45 days a year, is often heavy, but never lasts more than a week in the valleys. The cloud precipitation is great. Nearly all harbors are exposed to the sea, the wind from some direction, and the violent squalls which may occur at any time unheralded when the wind rushes down the Sounds. These are called summer harbors. The winter harbors of Vaag Fiord, Trangjisvaag, Vestmanhavn, Skaale Fiord, and Fugle Fiord are safe under all conditions of wind and weather. Gales are worse in the fall and winter and mostly from the west or southwest. Temperatures in the Faeroes range between 38^oF. in winter and 51^oF. in summer. The best average months are April, May, September and October. The tides are unique in this area. When it is high water in the northern islands, it is low in the southern part, the currents having considerable velocity during the change in tides. Due to the great depths of water, the wind has little effect on the tides.

CUT #57 and #64. SHOW #65 (B41-725) and #66 (B41-723)

As we do not have time to make a complete study of the Faeroes, let us look at the island that seems to suit us the best for naval purposes, the Island of Sydero, the most southern one. This island has two of the best of the above mentioned winter harbors, Trangjisvaag and Vaag Fiords. Both have a general East-West trend, with from 4 to 14 fathoms of water, except for one 22 and one 30 fathoms spot in each respectively. The right hand

the rainfall is large, particularly from October to March, and the fog is common from June to December. Snow falls about 45 days a year, is often heavy, but never lasts more than a week in the valleys. The cloud obscuration is great. Nearly all harbors are exposed to the sea, the wind from some direction, and the violent squalls which may occur at any time are felt when the wind rushes down the fjords. These are called summer harbors. The winter harbors of Vass Fjord, Frangjavyag, Vestmanna, Skeala Fjord, and Ragle Fjord are safe under all conditions of wind and weather. Gales are worse in the fall and winter and mostly from the west or southwest. Temperatures in the fjords range between 52° in winter and 51° in summer. The best average months are April, May, September and October. The tides are unique in this area. When it is high water in the northern fjords, it is low in the southern part, the currents having considerable velocity in the great depths of water.



No. 67.

As we do not have a study of the fjords, let us look at the for naval purposes, the This island has two of the best of the above mentioned winter harbors, Frangjavyag and Vass Fjord. Both have a general east-west trend, with from a to 14 fathoms of water, except for one 22 and one 30 fathoms spot in each respectively. The right hand

slide is a view of Trangjisvaag Fiord with the town of Tvera on the right shore.

The harbors have entrances about a mile wide, and total areas of about one and one-half square miles. They can take a limited number of light cruisers, destroyers and a few seaplanes. There is little land area for landing planes unless a great amount of construction work is done. Landing fields could be constructed in the few fairly flat places on the edge of the fiords, one being along the south side of Porkere Naes on Vaag Fiord. This hill slopes gently to the shore, its outer part being flat and moss grown. Trangjisvaag is reported to be one of the best anchorages in the Faeroes, and is the most important trading place. The seat of the Government is here. Both of these fiords can be netted, although mining is doubtful due to the strong tidal currents. The terrain lends them to the establishment of excellent defense positions.

CUT #65 and #66

As the Shetland Islands are so close to the Orkneys and the British Isles, only 25-100 miles, they will not be discussed at any great length. They are, however, in a good relative position to the North Sea, and only 180 miles west of southern Norway.

SHOW #57 (B41-760) and #67 (B41-729)

Although only 180 miles southeast of the Faeroes, their geology is entirely different. While the Faeroes seem like cast-

offs of Iceland, the Shetland Islands resemble the British Isles and Norway. The southern part of the largest island, Mainland, is a ridge of clay slate with sandstone and conglomerate on one side and small islands of gneiss and sienite on the other. The center of Mainland is a solid mass of gneiss, having blue-gray quartz on the west, sienitic greenstone and granite to the north. The other islands are composed of these minerals. The exports are cattle, fish, butter, hides, sheep, ponies and eggs. Peat and turf are nature's provision for fuel. The climate of these islands is somewhat cold and windy. Temperatures vary from an average of 38^oF. in winter to 54^oF. in summer. The rainfall averages about 44 inches per year, and is the worst during the winter. The winter being dark and gloomy and exceedingly stormy, is compensated for by the summer, middle of May to the end of July, when there is no complete darkness.

The general direction of the wind is northerly in summer, and southerly in the winter. These islands are less windy and foggy than the Faeroes. The best months are March to November. High tide occurs at about the same time throughout the islands. The same for low tides, but the Atlantic tidal wave creates considerable currents through the islands, being as great as 5 knots at springs. As will be noted on the slide, there are practically no places where a naval surface or air unit could base permanently, for all are open to the sea and winds. There are many temporary anchorages which could be used as bases during good weather. The best location is to the northeast of The Deeps on

of the British Isles, the Shetland Islands resemble the British Isles and Norway. The southern part of the largest island, Mainland, is a ridge of clay slate with sandstone and conglomerate on one side and small lava



No. 68.

average of 58° in winter to 64° in summer. The rainfall averages about 44 inches per year, and is the worst during the winter. The winter being dark and gloomy and exceedingly stormy, is compensated for by the summer, middle of May to the end of July, when there is no complete darkness.

The general direction of the wind is northerly in summer and southerly in the winter. These islands are less windy and foggy than the Feroes. The best months are March to November. High tide occurs at about the same time throughout the islands. The same for low tides, but the Atlantic tidal wave creates considerable currents through the islands, being as great as 5 knots at springs. As will be noted on the atlas, there are practical-ly no places where a naval surface or air unit could base permanently, for all are open to the sea and winds. There are many temporary anchorages which could be used as bases during good weather. The best location is to the northeast of The Deepa on

the west coast of the island of Mainland, and in Sillock Baas and Lerwick Harbor on the east coast.

CUT #57. SHOW #67 (B41-729) and #68 (B41-728)

In the water area to the northeast of the Deeps, seaplanes may be moored in the protected Sandsound Voe, Weisdale Voe, and Whiteness Voe in 4 to 17 fathoms of water. The area northeast or southeast of Score Holmes, about one and a half square miles each, must be used for take-offs and landings. These areas are comparatively smooth except when the swells roll in on a southwest wind. However, they are broken up by the islands to the southwest, and the area is not as bad as Seli Voe and Sand Voe, which are untenable as anchorages at that time. The area may be netted and mined in all the entrances, of which there are four. A good ship anchorage is east of Hildasay Island near the entrance to Whiteness Voe. The holding ground is good. Only a few ships can anchor at a time, one or two cruisers and a division of destroyers. Submarines could base here, although there are few resources and no facilities. The terrain does not permit of building landing fields as you can see, but it could be well defended. Scalloway was the seat of the government at one time, which is now located at Lerwick. Lerwick Harbor to the east of the town is small but well protected. It can accommodate a few destroyers and submarines in 4 to 10 fathoms. It can be netted, mined and defended. However, the holding ground is not of the best. Lerwick is the main shipping point in the

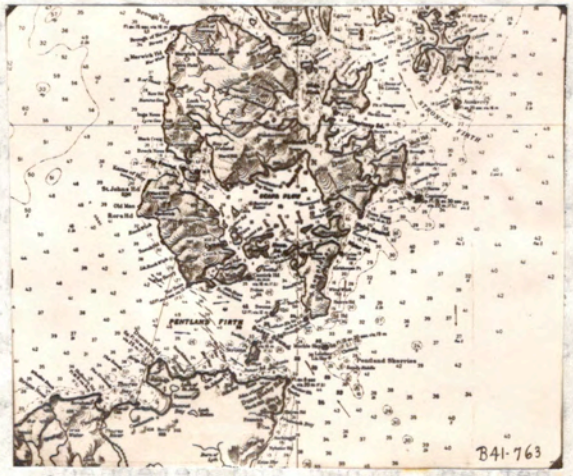
the west coast of the island of Mainland, and in Biflock Pass
and Lerwick Harbor on the east coast.

OUT 457. SHOW 457 (B41-709) and 458 (B41-728)

In the water area to the northeast of the Deags, seaplanes
may be moored in the protected Sandstrand Voe, Weisdale Voe, and
Whitness Voe in 4 to 10 fathoms of water. The area northeast
or southeast of Score Holms, about one and a half square miles
each, must be used for take-offs and landings. These areas are



No. 69.



No. 70.

could base here, although there
is. The terrain does not per-
mit you can see, but it could be
the seat of the government at one
Lerwick Harbor to the
It can accommo-
It can
It can
However, the holding ground is
not of the best. Lerwick is the main shipping point in the

Shetlands, and the harbor cannot be overcrowded. Sillock Baas off the southern entrance is wide open to the south, and is a good anchorage except during southerly winds. There are no locations for landing fields in this area.

CUT #67 and #68

We now come to the British Isles.

SHOW #57 (B41-760)

Only a few of the ports or bases of importance will be discussed, for to completely cover this thickly populated and concentrated area requires a separate study in itself. Furthermore, we are not at this time directly concerned with the North Sea, nor the East nor the South coasts of England. These also are considered to be more properly a study of another, though highly important, strategic area. The first, and well known base in the British Isles to be discussed is Scapa Flow.

CUT #57. SHOW #69 (B41-777) and #70 (B41-763)

This large body of water of some 50 square miles is one of the best fleet anchorages in the Isles. It is well protected from winds. The depths vary from 11 to 22 fathoms of water, with good holding ground, and there is very little tidal current. The fleet anchorage is in the southwest corner north of the island of Flotta, while other smaller bays inside can accommodate many light forces. Although there are five entrances, the southern

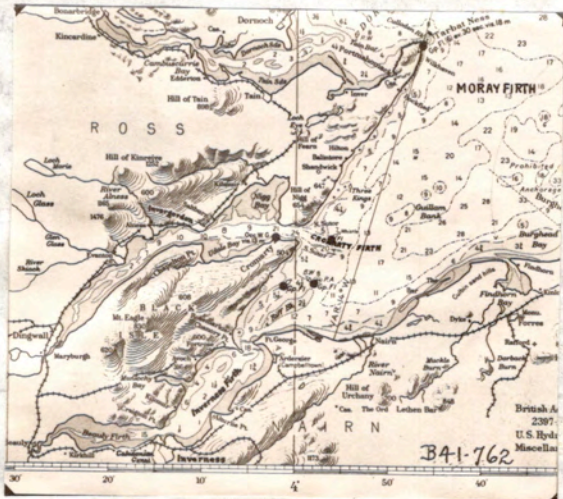
Shetlands, and the harbor cannot be overcrowded. Sillick Pass off the southern entrance is wide open to the south, and is a good anchorage except during southerly winds. There are no locations for landing fields in this area.

OUT 457 and 463

We now come to the British Isles.

SHAW 457 (541-760)

Only a few of the ports or bases of importance will be discussed, for to completely cover this thickly populated and congested area requires a separate study in itself. Furthermore,



No. 71.

The best fleet anchorages in the British Isles are well protected from winds. The depths vary from 11 to 22 fathoms of water, with good holding ground, and there is very little tidal current. The fleet anchorage is in the southwest corner north of the island of Hottel, while other smaller bays inside can accommodate many light forces. Although there are five entrances, the southern

entrance from Hay Sound, Holm Sound and water Sound have been permanently blocked since the last war. The other entrances are protected with booms and nets, Hoxa Sound being the main entrance. Scapa Flow today is well defended. Roads are sufficient on the various islands for the supply of defense materials, but resources are few. Scapa Flow with Lyness is listed as a Dockyard Port which is the British term for a naval establishment. There is fuel oil maintained at Lyness, and repair and drydock facilities are maintained in Scapa Flow. Land and sea planes can be accommodated in this area. It is interesting to note that although there is very little tidal effect within Scapa Flow, the flood or easterly current outside in Outer Sound of Pentland Firth sets at a maximum of ten knots and boils up for miles around, and the ebb or westerly current sets as much as nine knots. The well known town of Kirkwall on Wide Bay is a mile and a half across the island of Mainland to the north from Scapa Flow. There is an air field at Kirkwall. Off Kirkwall and including Shapinsay Sound, there are about ten square miles of anchorage area. This area is also well defended.

Although on the east coast of Scotland; the Dockyard Port of Cromarty is included because of the Naval Base at Invergordon with its resources of the mainland, and the naval facilities of repairs, drydock and fuel oil.

CUT #70. SHOW #69 (B41-777) and #71 (B41-762)

entrance from Hay Sound, Holt Sound and water Sound have been permanently blocked since the last war. The other entrances are protected with booms and nets, Holt Sound being the main entrance. Scapa Flow today is self-defended. Roads are excellent on the various islands for the supply of defense materials, but resources are few. Scapa Flow with Inness is listed as a Dockyard Port which is the British base for a naval establishment. There is fuel oil maintained at Inness, and repair and drydock facilities are maintained in Scapa Flow. Land and sea planes can be accom-



No. 72.



No. 72a.

OUR OFFICE (BAI-VV) AND #71 (BAI-702)

This area is well defended, and is a supporting base for Scapa Flow, being only 90 miles from it. Land and sea plane facilities are provided in this area. Inverness has ample supplies, and is on the Highland Railway connecting with Invergordon and southern England. Only minor repairs can be made, and only vessels of less than 14 feet draft can navigate Inverness Firth at high tide, and be locked through the 52 mile long Caledonian Canal. Only vessels less than 168 feet long and 38 feet of beam can use this canal, this being slightly less than the size of any of the 29 locks. However, the canal is valuable in transferring small defense craft to the West coast of Scotland.

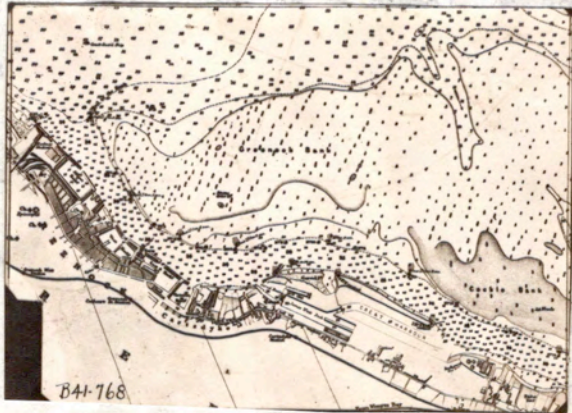
CUT #69. SHOW #71 (B41-762) and #72 (B41-761)

Invergordon is the center of the naval activity in this area. The dockyard pier and naval moorings are shown on the slide. The pier has 30-33 feet alongside at the end. Battleships can moor at the center buoys in a minimum of 51 feet, whereas the other moorings can take cruisers and lighter ships, but must moor bow and stern due to the current of 2.5 knots. The depths in Cromarty Firth up to and off Invergordon are sufficient for the largest ships. Invergordon is on the Highland Railway, and has ample communications to other parts of Scotland and England. Supplies and repair facilities are available. Cromarty Firth is now well netted, and further protected with booms, nets and mines.

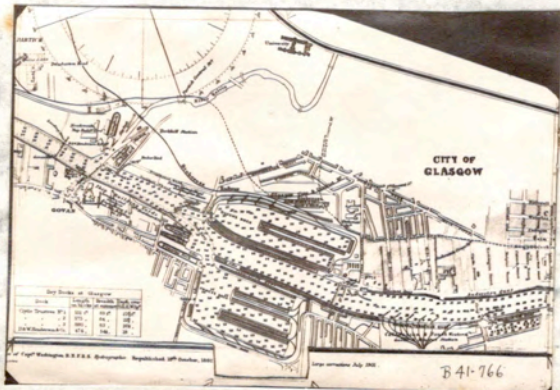
CUT #71 and #72. SHOW #69 (B41-777) and #72 a (B41-784)



No. 73.



No. 74.



No. 75.

Going now to the West Coast of Scotland, which is the eastern side of the vital northwest approach to the British Isles, we first come to the Hebrides-Isle of Skye-Peninsula Cantyne area enclosed by the dashed line on the slide. This area is dotted with islands, and indentations similar in topography to the fiords of Norway. The water is deep, but the shore line, however, is not steep-to, and there are innumerable small protected bays and anchorages, too numerous to discuss in this presentation, but which should be investigated by the students. Many of the small bays would make ideal locations for submarines and seaplanes, but it would be very difficult to protect all of them. Protection to individual places could readily be provided by nets, booms and anti-aircraft defense. There are very few resources and facilities in the whole area except on the mainland where a railroad serves all the important ports along the coast.

Cut # 72a. SHOW #69 (B41-777) and #73 (B41-764)

On the northern flank of the North Channel is located the city of Glasgow on the River Clyde. This city and the vicinity, including Greenock and Loch Long, contain the northernmost naval activities on the west coast of Scotland. There is a torpedo testing range of 7,000 yards on Upper Loch Long, and a Naval Torpedo Factory at Greenock.

CUT #69 and #73. SHOW #74 (B41-768) and #75 (B41-766)

North of Greenock on the River Clyde is a wide water area

Going now to the West Coast of Scotland, which is the eastern side of the vital northwest approach to the British Isles, we first come to the Hebrides-Isle of Skye-Pennine area enclosed by the dashed line on the slide. This area is dotted with islands, and indentations similar in topography to the fjords of Norway. The water is deep, but the shore line, however, is not steep-to, and there are innumerable small protected bays and anchorages, too numerous to discuss in this presentation, but which should be investigated by the students. Many of the small



bays would make ideal but it would be very difficult to individual boats and anti-aircraft and facilities in the railroad serves all

and airplanes, them. Protected by nets, few resources island where a coast.

On the northern flank of the No. 76 Channel is located the city of Glasgow on the River Clyde. This city and the vicinity, including Greenock and Loch Long, contain the northernmost naval activities on the west coast of Scotland. There is a torpedo testing range of 7,000 yards on Upper Loch Long, and a Naval Torpedo Factory at Greenock.

CUT #69 and #73. SHOW #74 (B41-768) and #75 (B41-766)

North of Greenock on the River Clyde is a wide water area

of six square miles with depths of from 3 to 30 fathoms of water with mud bottom. This area is well protected and is sufficient for anchoring light forces and seaplanes. The land area is adaptable for landing fields. There are three graving docks and a small marine railway at Greenock. Numerous railroads concentrate in this area, particularly Glasgow. Although the channel to Glasgow at mean low water averages only 24 to 26 feet, a tidal range of 6 to 10 feet permits vessels of greater draft to reach the city. The channel, however, averages only 150 yards in width. Glasgow is one of the greatest ship-building centers in the world. There are a dozen shipbuilding companies in this area, five graving docks, the largest being 880 by 83 feet with $26\frac{1}{2}$ feet over the sill at mean low water, and four small marine railways. Glasgow has many resources and extensive repair facilities, and although primarily a commercial shipping center, it has also a naval establishment. It is defended and has large quantities of fuel oil. The Forth and Clyde Canal connects the River Clyde below Glasgow to the Firth of Forth on the east coast on which is situated the naval dockyard at Rosyth. Small craft not over 68 by 19, by 8 feet draft, can navigate this canal through 38 locks.

CUT #74 and #75. SHOW #69 (B41-777) and #76 (B41-769)

Although not a naval center, we should pause to take a look at the great shipping port of Liverpool on the River Mersey. Besides having about six miles of anchorage area in the river

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 with and bottom. This area is well protected and is sufficient
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No. 77.

of fuel oil. The port and Clyde connects the River Clyde
 below Glasgow to the Firth of Forth on the east coast in which
 is situated the naval dockyard at Rosyth. Small craft not over
 60 ft long, by 8 feet draft, can navigate this canal through 38
 locks.

CUT #44 and #45. SHOW (44-765) and #45 (44-765)

Although not a naval center, we should pause to take a look
 at the great shipping port of Liverpool on the River Mersey.
 Besides having about six miles of wharve area in the river

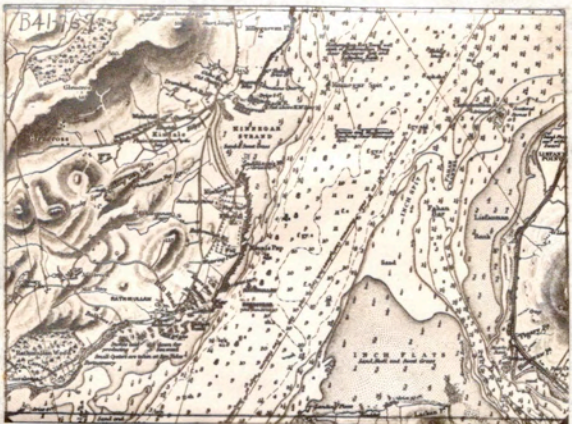
with depths from 24 to 70 feet, but subjected to 5 knot currents at spring, there are the great Liverpool wet docks, about 70 in number. These extend in an almost unbroken line for 6 miles on the east bank of the river and cover an area of 430 acres with a dock frontage of 27 miles. Ships can be maneuvered from one end to the other without going into the river. A system of pumping river water into the docks exists in order to increase the depth of water within them. There is one large graving dock of 925 by 94 feet which can accommodate large cruisers. Liverpool is defended, has numerous repair facilities, fuel oil, resources, and is well protected from the weather. There are many aircraft landing fields in this area. Liverpool is the shipping port of the industrial center at Manchester, and connected ^{with} that city by the important Liverpool-Manchester Canal which carried over 7,000,000 tons of shipping in 1940.

CUT #76. SHOW #69 (B41-777) and #77 (B41-765)

About two hundred miles south of Liverpool by water is the naval base of Pembroke Dock, flanking St. George's Channel, the southern entrance to the Irish Sea. Pembroke Dock has fuel oil, is defended, has three drydocks - one naval -, is equipped for making naval repairs, but can only handle a limited number of lighter ships due to the confined area, and depths of from 4 to 8 fathoms in the Cleddan River off the dockyard.

CUT #69 and #77

with depths from 24 to 70 feet, but subjected to 2 knot currents



No. 78.

925 by 94 feet which can accommodate large cruisers. Liverpool

is defended by batteries, fuel oil, resources,

and is well situated. There are many aircraft

pool is the shipping port of

with

and connected that city by

Canal which is over



No. 79.

About two hundred miles south of Liverpool by water is the

naval base of Pembroke Dock, situated at the mouth of the

southern entrance to the Bristol Channel. The

is defended, has three drydock

making naval repairs can

lighter ships due to the con-

8 fathoms in the Cleddon River



No. 80.

Let us now consider the large island of Eire. Starting from the north, there is the naval anchorage in Lough Swilly with the small naval base at Rathmullan located on the western shore. These locations are on the northern coast of Eire and flank the North Channel, northern entrance to the Irish Sea.

SHOW #69 (B41-777) and #78 (B41-767)

Lough Swilly and Rathmullan are both defended, have fuel oil storage, and the base at Rathmullan has repair facilities. The anchorage in 8 fathoms off Rathmullan, 12 miles from the entrance to Lough Swilly, is protected in all weather. Although the current runs 2.5 knots at springs in the lough, the holding ground is good. There is ample room for take-off and anchoring seaplanes, and the terrain in some places nearby is suitable for landplane bases.

CUT #78. SHOW #69 (B41-777)

130 miles by water southwest of Lough Swilly, on the northwestern tip of Eire, is an excellent bay area containing Blacksod Bay, and just around the corner to the southeast, 30 more miles, is Clew Bay.

CUT #69. SHOW #79 (B41-770) and #80 (B41-771)

Blacksod Bay has from 4 to 8 fathoms of water in a ten square mile area with good holding ground. This bay is well protected from the weather, and has very little current. It

Let us now consider the large island of Linné. Starting from the north, there is the naval anchorage in Lough Swilly with the small naval base at Rathmullan located on the western shore. These locations are on the northern coast of Linné and flank the North Channel, northern entrance to the Linné Sea.

SHOW #80 (PAI-VVV) and #78 (PAI-VVI)

Lough Swilly and Rathmullan are both defended, have fuel oil storage, and the base at Rathmullan has repair facilities. The anchorage in 8 fathoms off Rathmullan, 12 miles from the entrance to Lough Swilly, is protected in all weather. Although the current runs 2.5 knots at springs in the lough, the holding ground is good. There is ample room for take-off and anchoring



No. 81.

CUT #89. SHOW #79 (PAI-VVQ) and #80 (PAI-VVI)

Blackod Bay has from 4 to 8 fathoms of water in a few square mile area with good holding ground. This bay is well protected from the weather, and has very little current. It

can be netted, mined and defended, and is excellent for light forces. A larger anchorage area exists to the south of the entrance with 10 to 25 fathoms of water, but it is unprotected and can only be classed as temporary for large ships. There are few resources here and no facilities. A small 60 foot wide by 8 foot deep channel connects Blacksod Bay with Broadhaven Bay to the north, and at high tide a narrow, 8 foot deep channel connects the bay with Clew Bay to the south.

Clew Bay with a 35 square mile area can anchor a large force in 6 to 18 fathoms of water. Its western side is divided into two entrances by Clare Island, both of these entrances being 2 miles wide. They can be netted and mined. The bay can be defended, although at present no defenses exist. There are a few resources, but no repair facilities. The Midland-Great Western Railway runs along the eastern and northern shores. This railroad also connects with Galway Bay to the South.

CUT #79 and #80. SHOW #69 (B41-777) and #81 (B41-772)

Galway Bay, 70 miles by water to the south of Clew Bay, can accommodate a large fleet in 5 to 26 fathoms of water, with the light forces anchoring in the eastern part in North and South Bays. Inner Galway Bay has an entrance of five miles, but fifteen miles to the west and southwest are the protecting Isles of Aran which give the bay four entrances from one to four miles wide, all of which can be netted and mined. The area can be defended. There are suitable locations for landing fields and

can be mined, mined and defended, and is excellent for light forces. A larger anchorage area exists to the south of the entrance with 10 to 25 fathoms of water, but it is unprotected and can only be classed as temporary for large ships. There are few resources here and no facilities. A small 60 foot wide by 8



No. 82.

feet deep channel connects the bay with the Gulf of Mexico to the north, and at high tide a narrow channel connects the bay with the Gulf of Mexico to the south. Two entrances by the bay are 18 fathoms deep. They can be mined and defended, although at present no defenses exist. There are a few resources, but no repair facilities. The Midland-Pacific Western Railway runs along the eastern and northern shores.



No. 83.

This bay is 15 miles wide, and is an excellent anchorage for light forces. It is situated on the south of the Gulf of Mexico, and is 15 miles from the coast. The bay is 15 miles wide, and is an excellent anchorage for light forces. It is situated on the south of the Gulf of Mexico, and is 15 miles from the coast. The bay is 15 miles wide, and is an excellent anchorage for light forces. It is situated on the south of the Gulf of Mexico, and is 15 miles from the coast.

seaplane anchorages. The City of Galway, on the Midland Great Western Railway, is accessible to the bay and other parts of Eire. Fuel oil is stocked at Galway and ordinary repairs can be made.

It may be mentioned, in passing, that the west coast of Eire, like the west coast of Scotland, has many small bays and coastal indentations that can accommodate small units of light forces or submarines, and afford excellent protection from wind, sea and hostile forces.

CUT #81. SHOW #69 (B41-777) and #82 (B41-774)

Our next base location, and World War base for many United States destroyer officers, is at Bear Haven on Bantry Bay in the southwest corner of Eire. Bear Haven has a naval anchorage for light forces in $5\frac{1}{2}$ to 12 fathoms of water and good holding ground. There is an east and west entrance which can readily be netted and mined. The area can be defended. Bantry Bay has from 6 to 26 fathoms of water with good holding ground. Deep water extends close to the shore line. There is ample anchorage area for a large force in the eastern part off the town of Bantry which is on the Bantry Extension Railway with connections to Cork and Queenstown.

CUT #82. SHOW #69 (B41-777) and #83 (B41-775)

On the west flank of St. George's Channel and 95 miles from Bear Haven is the familiar World War base of Haulbowline at Queenstown on Cork Harbor. At the start of the present war, this

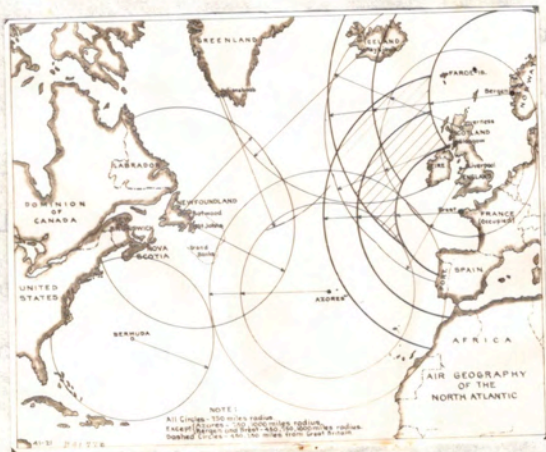
... The City of Galway, on the Midland Great
Western Railway, is accessible to the bay and other parts of the
... It may be mentioned, in passing, that the west coast of
like the west coast of Scotland, has many small bays and coastal
indentations that can accommodate small units of light forces or



No. 84.

CUT #81.

... Our next base location
States Destroyer officers, is at Bear Haven on Bear Bay in the
southwest corner of the... Bear Haven has a naval anchorage for
light forces in 5 to 12 fathoms of water and good holding ground.



No. 85.

CUT #82. SHOW #82 (841-777) and #82 (841-773)

On the west bank of St. George's Channel and 93 miles from
Bear Haven is the familiar World War base of Halifax at
Greenstown on Cork Harbor. At the start of the present war, this

base was closed, as the British had removed most of the modern equipment when Ireland became a free State.

CUT #69. SHOW #83 (B41-775) and #84 (B41-773)

Haulbowline is situated in the northwestern part of Cork Harbor on the southern side of the Inner Man of War Anchorage. This anchorage and the Outer Man of War Anchorage can accommodate many large and small vessels in from 14 to 76 feet of water. Vessels must moor in the inner anchorage to the buoys provided. Haulbowline has a naval drydock, and there are three other commercial graving docks in the vicinity. The area can be defended, the harbor can be netted and mined, there are many resources, and base facilities can be readily provided. The area can accommodate seaplanes and landplanes.

CUT #83 and #84

We thus complete our study of naval bases, base sites, and anchorages in this large and important area of the North Atlantic Ocean, and Northwestern approach to the British Isles.

Finally, let us now see how this area might be covered by aircraft operations, when the variable and bad weather conditions permit.

SHOW #85 (B41-778)

This slide shows the area of the North Atlantic that can be covered by air operations to a distance of 750 miles radius from

a few strategically located and established air bases. The red lines indicate this coverage from British bases (Bermuda, St. Johns, Botwood, Inverness, Glasgow and Liverpool), or under British control (Reykjavik); the heavy black lines from bases under German control (Bergen and Brest), and the green lines, including a 1,000 mile circle from the Azores, which have a strategically important position in this vast area. The dotted red line shows an area to a radial distance of 450^{and 750} miles from bases in the British Isles, and the inner and outer black lines show additional distance circles of 450 and 1,000 miles from Bergen, Norway and Brest in occupied France. Note the hatched area covering the northwestern approach to the British Isles included between the 450 and 1,000 mile circles from Bergen and Brest. It is within this area that the British are receiving their most serious shipping losses and through which most of their important trade proceeds. This area is also well covered by German planes from other Norwegian and German air bases, as it is within the radius of their latest planes. If the Germans invaded Eire their air operations could be extended further to the west. This area can also be well covered by British aircraft to even a lesser distance. The whole area is covered two or more times from other established air bases in the Maritime Provinces and the United States in the West, and the British Isles in the East. The blue lines indicate a part of the effort the United States could make by air operations over the northwest Atlantic Ocean.

Thus the necessary effort from any one base can be reduced by dividing the operations. During the summer and fall months the northwest North Atlantic can be covered by air operations from Greenland, as shown by the wavy red and blue lines. This assists the Iceland effort.

As will be readily recognized, the Azores have an important bearing on the picture. It would be far better to keep them out of German hands than to let the Axis powers build up their present meager facilities; either for aircraft, submarines, or raiders. Reports state that there are many Nazis now living in these islands.

CUT #85

We conclude that Great Britain and its Dominions in this theater have great strength of relative position, with adequate bases both West and East; that the Northwestern Atlantic is at present no serious problem, but that considerable more means must be provided before they achieve the necessary freedom of action in the Northeastern Atlantic.

The North Atlantic Ocean
Newfoundland and the Maritime Provinces to the British Isles
including Greenland and Iceland.

Given by... Comdr. I. R. Chambers, U.S.N.

Date..... April 21, 1941

LEFT SCREEN (FACING STAGE)

RIGHT SCREEN (FACING STAGE)

Box No.	FILE No.	B	TITLE OF SLIDE	Box No.	FILE No.	B	TITLE OF SLIDE
1	41-684		Strategic Area of the North Atlantic Ocean				BLANK
2	41-673		North Atlantic Winds Force - January	3	41-674		North Atlantic Wind Force - July
4	41-255		Atlantic Wind Velocity Winter	5	41-256		Atlantic Wind Velocity Summer
6	41-675		North Atlantic Gales Force 7 - January	7	41-676		North Atlantic Gales Force 7 - July
8	41-261		Atlantic Gales Force 8 - Winter	9	41-262		Atlantic Gales Force 8 - Summer
			BLANK				BLANK
10	41-263		Atlantic Fog - Winter	11	41-264		Atlantic Fog - Summer
12	41-265		Atlantic Mist - Winter	13	41-266		Atlantic Mist - Summer
14	41-267		Atlantic Haze - Winter	15	41-677		N. Atlantic Haze - Summer
			BLANK				BLANK
16	41-678		North Atlantic Any Rain - January	17	41-679		North Atlantic Any Rain - July
			BLANK				BLANK
			BLANK	18	41-758		Weather Summary - North Atlantic
			BLANK				BLANK
19	41-670		Source of Icebergs- North Atlantic	20	41-671		Routes of Icebergs- North Atlantic
			BLANK	21	38-389		Iceberg off Newfoundland
22	41-672		Cold Wall, Grand Banks- Newfoundland				BLANK
			BLANK	23	38-312		North Atlantic Shipping Lanes
24	41-685		Temperatures - W. Atl.	25	41-686		Temperatures - E. Atl.
			BLANK				BLANK
26	38-311		Cables and Radio - North Atlantic	27	41-680		Cables and Radio- N. Atl. and British Isles
			BLANK	28	41-681		Mining Areas- N. Atl.
			BLANK				BLANK

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Box No.	FILE No.	B	TITLE OF SLIDE	Box No.	FILE No.	B	TITLE OF SLIDE
23	38-312		N.Atl. Shipping Lanes	29	41-669		U.S.Export Trade-World
			BLANK				BLANK
			BLANK	30	41-759		Western N.Atlantic Ocean
			BLANK				BLANK
31	39-482		Newfoundland and Mari- time Province	32	39-500		St. Lunaire Bay
31			SAME				BLANK
31			SAME	33	41-727		Bay of Exploits
35	41-593		Newfoundland	34	41-592		St. John Harbor Area
31	39-482		Newfoundland and Mari- time Provinces				BLANK
35	41-593		Newfoundland	36	41-594		Little Placentia Harbor
31	39-482		Newfoundland and Mari- time Provinces	37	39-506		St. Pierre Harbor
35	41-593		Newfoundland	38	41-776		Port au Port-St.George Bay
31	39-482		REPEAT BLANK				BLANK BLANK
31	39-482		REPEAT	39	39-486		Sydney Harbor
31			SAME	40	38-313		City of Halifax
41	30-250		Halifax Harbor	42	39-490		Bedford Basin
31	39-482		Newfoundland and Mari- time Provinces	43	39-489		Saint Margaret Bay
31			SAME				BLANK
31			SAME	44	39-484		St. John Harbor, N.B.
			BLANK				BLANK
30	41-759		W.North Atl.Ocean	45	41-710		Greenland
45	41-710		Greenland	46	41-737		Julianehaab Harbor
45			SAME	46a	41-779		Arsuk Fiord

The North Atlantic Ocean
 Newfoundland and the Maritime Provinces to the British Isles
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Box No.	FILE No.	B	TITLE OF SLIDE	Box No.	FILE No.	B	TITLE OF SLIDE
47	41-711		Godthaab Havn.	48	41-712		Ice-cap north of Godthaab
45	41-710		Greenland	49	41-715		Holsteinsborg Harbor
45			SAME	50	41-713		Jakobshavn Glacier
51	41-716		Ice Cap and Mts. Greenl'd	52	41-718		Ice Cap and Glacier - Greenland
45	41-710		Greenland	53	41-714		Ella Island Harbor
54	41-717		Scoresby Sound	55	41-719		East Coast of Greenland
45	41-710		Greenland	56	41-687		Angmagssalik-Greenland
			BLANK				BLANK
57	41-760		Eastern N. Atlantic Area				BLANK
58	41-705		Iceland	59	41-721		Iceland's Volcanic Plateau
58			SAME	60	41-707		Reykjavik, Foxe Bay, Iceland
61	41-709		Reykjavik Harbor	60			SAME
58	41-705		Iceland	62	41-706		Reydar, Eske Fiords - Iceland
63	41-722		Eske Fiord - Iceland	62			SAME
			BLANK				BLANK
57	41-760		Eastern North Atlantic Ocean	64	41-724		Faeroe Islands
65	41-725		Sydero Id. - Faeroes	66	41-723		Trangjisvaag Fiord - Faeroes
			BLANK				BLANK
57	41-760		Eastern N. Atl. Ocean	67	41-729		Shetland Islands
68	41-728		The Deeps and Lerinch-Shetlands	67			SAME
			BLANK				BLANK
57	41-760		Eastern N. Atl. Ocean				BLANK
69	41-777		Bases - British Isles	70	41-763		Scapa Flow - Orkneys

